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ROADSIDE STATION FOR DETERMINING WEIGHTS AND DIMENSIONS OF TRUCKS

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The reports of research published in this magazine are necessarily qualified by the conditions of the tests from which the data are obtained. Whenever it is deemed possible to do so, generalizations are drawn from the results of the tests; and, unless this is done, the conclusions formulated must be considered as specifically pertinent only to described conditions.

In This Issue

	Page
A Study of the Weights and Dimensions of Trucks	37

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A STUDY OF THE WEIGHTS AND DIMENSIONS OF TRUCKS

Reported by J. T. THOMPSON, Highway Research Specialist, U. S. Bureau of Public Roads, and Professor of Civil Engineering, the Johns Hopkins University



DETERMINING THE WEIGHTS AND DIMENSIONS OF TRUCKS.

How do the over-all dimensions of loaded motor vehicles vary with manufacturer's rated capacity?

How are the gross loads of motor vehicles distributed to the various axles?

To what extent do operators exceed the manufacturer's recommended loading, and how does prevalency of this "overloading" vary with manufacturer's ratings?

To what extent are tires being similarly overloaded?

THESE ARE typical of the questions which should be answered by those who must consider dimensions and load concentrations in providing clearance and strength in the design of highways and highway bridges, by highway economists who would properly allocate highway costs to the various classes of vehicles, by manufacturers of both vehicles and tires, and by highway administrators and legislators who would intelligently restrict motor vehicle size and weight and legislate fair tax rates to sustain highway programs.

Those who have had to seek the answers to these and similar questions know that hitherto existing data, such as manufacturer's specifications, fail to provide them. So far as the writer knows, there is no way to obtain this information except by establishing roadside "clinics" where vehicles may be studied as they pass.

OBSERVATIONS MADE ON TWO MAIN TRUCK ROUTES

The following data have been obtained from just such clinics. During the summer and fall of 1934 the Bureau of Public Roads of the United States Department

of Agriculture with the cooperation of the Johns Hopkins University, the Maryland State Roads Commission, and the Commissioner of Motor Vehicles of Maryland, operated two stations at which commercial vehicles were weighed and measured. One of these was located on Route U S 40, leading north from Baltimore toward Philadelphia, the other on Route U S 1 leading south from Baltimore toward Washington. These stations were operated alternately for periods of approximately 2 weeks from the middle of June to the middle of November. During the entire period 10,700 vehicles were observed, 7,100 when loaded and 3,600 when empty. It is believed that the data constitute a representative sample of truck traffic on main highways in this area. Further investigation is needed to determine if the data are representative of truck traffic on main highways generally.

The field party of 4 men consisted of a uniformed officer to direct traffic, a notekeeper, and 2 others who shared the duties of weighing and measuring. Aside from the scales no other special equipment was used. A cloth tape and a level-rod with a horizontal arm for calipering heights answered every purpose.

In order to avoid the recurrence of data relating to identical vehicles frequently passing the station, identification cards were issued to all operators and no vehicle was recorded more than once loaded and once empty when proceeding in each direction during any one 2-week period.

The procedure was as follows: All commercial vehicles were stopped. Identification cards, if presented, were examined. If a card were presented indicating that the vehicle, loaded or empty, had already

been recorded when traveling in the same condition and in the same direction during the current 2-week period, the vehicle was permitted to pass. Otherwise it was run on the scales and weighed first with all wheels on the platform. It was then moved ahead by stages until, first the forward axle, and then each successive axle was off the platform, determining after each movement the weight carried on the axles remaining on the platform. At the same time the over-all length, height, width, and wheel base were determined; the manufacturer's marker and registration data were inspected for make of vehicle and manufacturer's rated capacity; and the license number was noted.

As the field reports came into the office the information contained in and derived from them was tabulated on large ruled master sheets, and these were used in segregating and analyzing the data. Where the data permitted, pay loads were determined by subtracting the measured empty weights of vehicles from their gross weights as measured on loaded trips. The determination was facilitated by preparing, for each vehicle initially observed, a file card, bearing the license number, on which was entered after each observation of the same vehicle a reference to the pertinent field data sheet.

Before proceeding to the remainder of this report, the reader should have in mind the size and weight restrictions of Maryland laws because of their influence upon the data. From the beginning of the study in June until the middle of October no attention was paid to violations of these laws nor were penalties of any kind imposed. This was done intentionally to encourage unrestricted operation. The number of observed weight violations was small—less than one percent. After the middle of October, at the insistence of State authorities, the laws were enforced and nine arrests were made for overweight, 1,500 weighings being recorded during the corresponding period.

The Maryland laws may be briefly summarized as follows:

Maximum dimensions

Width.....	96 inches.
Length.....	Unrestricted.
Height.....	Unrestricted.

Maximum gross weights

On solid tires.....	650 pounds per inch of tire width.
On pneumatic tires:	
Single unit, 4 wheels, 2 axles.....	25,000 pounds.
Single unit, 6 wheels, 3 axles.....	40,000 pounds.
Combination of 2 vehicles (tractor and semitrailer or tractor and full trailer) combined weight.....	40,000 pounds. ¹

GROSS WEIGHTS NOT IN PROPORTION TO RATED CAPACITIES

Reference will be made in this report to the term "manufacturer's rated capacity" as applied to both vehicles and tires. Applied to single vehicles and tires, the term as used means the carried load which the manufacturer recommends as safe and economical for the vehicle or tire in question. Applied to tractor-semitrailer combinations, it refers to the carried load of the semitrailer only.

¹ There is nothing in the Maryland law to prevent adding to these combinations of 2 vehicles an indefinite number of units weighing as much as 40,000 pounds each.

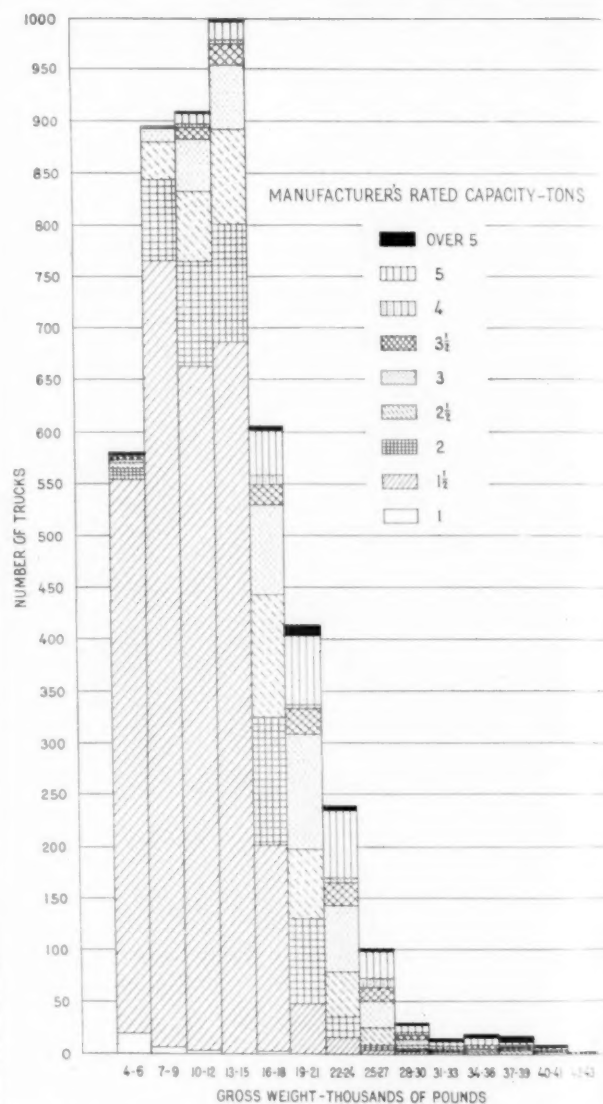


FIGURE 1.—FREQUENCY DISTRIBUTION BY GROSS WEIGHTS OF LOADED SINGLE VEHICLES.

Figure 1 and table 1 show the frequency distribution by the gross weights of loaded single vehicles, expressed in terms of numbers of vehicles and the percentages of the total number of loaded vehicles of each capacity class having gross weights falling within various class limits, defined to the nearest thousand pounds. In tables 2 and 3 these data are segregated respectively into 4-wheel and 6-wheel classes. As stated above, 4-wheel single vehicles may legally carry 25,000 pounds and 6-wheelers 40,000 pounds.

It is immediately evident that the gross loads of vehicles of small capacity are much greater in proportion to the rated capacity than are those of large capacity trucks. Comparing the 1½- and 5-ton classes in table 1, for example, the ratio of rated capacities is 3.33. If gross weight were proportional to capacity, 5-ton trucks would have an average gross weight of 3.33 by 10,500 equals 35,000 pounds; actually they average 21,600 pounds.

TABLE 1.—Frequency distribution of gross weights of all loaded single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average gross weight	Gross weight, 1,000 pounds														Total observations
		4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1 ton	6,400	70.0	20.0	6.7		3.3										30
1½ tons	10,500	18.4	26.1	22.6	23.7	6.9	1.7	0.4	0.1	0.1						2,920
2 tons	14,400	1.9	14.5	19.3	21.1	23.1	15.4	3.8	.7	.2						533
2½ tons	16,300	1.3	7.9	14.6	20.1	26.0	14.6	9.6	4.2	1.1		0.2	0.4			458
3 tons	18,100	.2	3.3	11.7	15.0	20.4	26.2	14.8	5.6	1.2	0.7	.2	.5	0.2		427
3½ tons	20,600	2.3		7.6	15.3	14.5	19.0	17.6	11.4	3.1	1.5	5.3	.8	.8	0.8	131
4 tons	21,600		2.9	8.6	8.6	22.8	5.6	8.6	22.8	8.6			2.9			35
5 tons	21,600	.4		4.2	6.9	16.8	25.6	25.6	9.5	3.1	1.5	3.0	2.3	1.1		262
Over 5 tons	25,400	2.3		4.7	4.7	11.6	23.2	9.3	9.3	2.3	4.7	4.7	13.9	9.3		43

TABLE 2.—Frequency distribution of gross weights of loaded 4-wheel single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average gross weight	Gross weight, 1,000 pounds														Total observations
		4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1 ton	6,400	70.0	20.0	6.7		3.3										30
1½ tons	10,100	19.8	26.9	23.5	23.5	5.6	0.4	0.1	0.1	0.1						2,695
2 tons	14,300	2.0	14.2	20.1	21.7	22.9	14.8	3.6	.7							511
2½ tons	16,000	1.4	8.4	15.2	20.5	25.6	14.9	9.8	4.0	.2						429
3 tons	17,800	.3	3.3	11.4	15.7	20.4	27.6	15.4	5.3	.3	0.3					395
3½ tons	18,600	2.8		9.4	17.0	17.9	20.8	18.9	12.3	.9						106
4 tons	18,800			17.6	5.9	35.2	5.9	11.8	23.6							17
5 tons	20,100	.5		5.1	7.9	18.1	28.1	28.2	10.7	.9	.5					216
Over 5 tons	19,200	4.3		8.7	8.7	17.4	34.9	4.3	17.4		4.3					23

TABLE 3.—Frequency distribution of gross weights of loaded 6-wheel single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average gross weight	Gross weight, 1,000 pounds														Total observations
		4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1 ton																0
1½ tons	14,900	2.2	12.9	12.9	25.7	23.1	17.8	4.9	0.5							225
2 tons	17,300		13.7	4.5	9.1	27.3	31.8	9.1		4.5						22
2½ tons	21,200			6.9	13.8	31.0	10.3	6.9	6.9	13.8		3.5	6.9			29
3 tons	22,100		3.1	15.6	6.3	18.8	9.4	6.3	9.4	12.3	6.3	3.1	6.3	3.1		32
3½ tons	23,100				8.0		12.0	12.0	8.0	12.0	8.0	28.0	4.0	4.0	4.0	25
4 tons	24,300				11.1	11.1	5.6	5.6	22.0	16.7						18
5 tons	28,500		5.6		2.2	10.9	13.0	13.0	4.3	13.0	6.6	17.4	13.0	6.6		46
Over 5 tons	32,500					5.0	10.0	15.0		5.0	5.0	10.0	30.0	20.0		20

In tables 4, 5, and 6 vehicles of the heavier gross weights are analyzed according to rated capacity. Table 4 is a classification of all single vehicles of gross weights exceeding 21,000 pounds. Table 5 is a similar classification of the 4-wheel vehicles only, and table 6 deals similarly with 6-wheel vehicles only.

Table 4 shows that of 4,839 single vehicles observed 427 or 8.9 percent had gross weights in excess of 21,000 pounds. It is a common belief that such gross weights are associated mainly with vehicles of 5- and over-5-ton rated capacity. Actually, as shown by table 4, only 144 or a trifle over one-third of the 427 vehicles of gross weight exceeding 21,000 pounds were of these two largest rated-capacity classes. Over a fourth of the total number—112 out of 427—were vehicles of 2½ tons rated capacity or smaller, and 16 were trucks of 1½ tons rated capacity, sizes generally well within the common conception of medium vehicles.

Referring again to table 4, it will be seen that only 190 (4.0 percent) of all loaded vehicles were found to have gross weights in excess of 24,000 pounds, and that

the number of these that were of the 5- and over-5-ton capacity classes was only 73 (38.4 percent). Again vehicles rated at 2½ tons capacity and less were found to constitute a very considerable percentage (18.4 percent) of the total, and still a few 1½-ton trucks were included.

As shown by table 1, it is not until gross weight rises in excess of 30,000 pounds that the last of the 1½- and 2-ton trucks disappear; but the 61 trucks, shown by table 4 to be in excess of that weight, include representatives of all rated-capacity classes from 2½ tons upward. In fact, not far from half of the number were rated at less than 5 tons capacity.

The final columns of table 4 show that 10 or about 0.2 percent of all observed loaded single vehicles weighed above 40,000 pounds. All of these were rated at 3-ton capacity or more and 7 of the 10 were of the 5- and over-5-ton classes. By comparison with table 6 it will be seen that all of these trucks were 6-wheel vehicles, and all were violators of the Maryland law which sets the limit for such trucks at 40,000 pounds;

TABLE 4.—Classification of all heavy-loaded single vehicles according to manufacturer's rated capacity and gross weight

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having gross weights exceeding—							
		21,000 pounds		24,000 pounds		30,000 pounds		40,000 pounds	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1 ton.....	30								
1½ tons.....	2,920	16	3.8	3	1.6				
2 tons.....	533	25	5.9	5	2.6				
2½ tons.....	427	71	16.6	27	14.2	3	4.9	1	10.0
3 tons.....	131	54	12.6	31	16.3	12	19.7	2	20.0
3½ tons.....	35	18	4.2	15	7.9	4	6.6		
4 tons.....	262	121	28.3	54	28.4	21	34.4	3	30.0
5 tons.....	43	23	5.4	19	10.0	14	22.9	4	40.0
Over 5 tons.....									
Total.....	4,839	427	100.0	190	100.0	61	100.0	10	100.0
Percentage of total loaded vehicles.....	100	8.9		4.0		1.2		0.2	

TABLE 5.—Classification of heavy-loaded 4-wheel single vehicles according to manufacturer's rated capacity and gross weight

Manufacturer's rated capacity	Total all loaded 4-wheel vehicles	Loaded 4-wheel vehicles having gross weights exceeding—					
		21,000 pounds		24,000 pounds		30,000 pounds	
		Number	Percent	Number	Percent	Number	Percent
1 ton.....	30						
1½ tons.....	2,695	4	1.3	5	2.1		
2 tons.....	511	22	7.3	4	4.2		
2½ tons.....	429	60	19.8	18	18.7		
3 tons.....	395	84	27.7	23	23.9	1	33.3
3½ tons.....	106	34	11.2	14	14.6		
4 tons.....	17	6	2.0	4	4.2		
5 tons.....	216	87	28.8	26	27.1	1	33.3
Over 5 tons.....	23	6	2.0	5	5.2	1	33.4
Total.....	4,422	303	100.0	96	100.0	3	100.0
Percentage of total loaded 4-wheel vehicles.....	100	6.9		2.2		0.1	

TABLE 6.—Classification of heavy-loaded 6-wheel single vehicles according to manufacturer's rated capacity and gross weight

Manufacturer's rated capacity	Total all loaded 6-wheel vehicles	Loaded 6-wheel vehicles having gross weights exceeding—							
		21,000 pounds		24,000 pounds		30,000 pounds		40,000 pounds	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1 ton.....									
1½ tons.....	225	12	9.7	1	1.0				
2 tons.....	22	3	2.4	1	1.1				
2½ tons.....	29	11	8.9	9	9.6	3	5.2		
3 tons.....	32	15	12.1	13	13.8	6	10.3	1	10.0
3½ tons.....	25	20	16.1	17	18.1	12	20.7	2	20.0
4 tons.....	18	12	9.7	11	11.7	4	6.9		
5 tons.....	46	34	27.4	28	29.8	20	34.5	3	30.0
Over 5 tons.....	20	17	13.7	14	14.9	13	22.4	4	40.0
Total.....	417	124	100.0	94	100.0	58	100.0	10	100.0
Percentage of total loaded 6-wheel vehicles.....	100	29.8		22.6		13.9		2.4	

yet in view of the fact that their heavier loads were carried on six wheels, many of these vehicles unquestionably made less demand upon the strength of the road than the heavier 4-wheel vehicles of gross weights between 21,000 and 24,000 pounds.

By comparing tables 4, 5, and 6, it will be seen that 58 of the 61 vehicles observed to have gross loads over 30,000 pounds were 6-wheelers. The three 4-wheel vehicles all weighed less than 40,000 pounds, and, as shown by table 5, represented the 3-, 5-, and over-5-ton rated-capacity classes.

In the larger groups of vehicles of gross weights exceeding 24,000 and 21,000 pounds the numbers of 4-wheel vehicles are relatively higher, made so by the preponderance of the lighter gross loads carried on 4 wheels.

VEHICLES OF ALL RATED CAPACITIES FOUND TO CARRY HEAVY LOADS

Table 7 and figure 2 show the gross-weight-frequency distribution for tractor-semitrailer combinations. The tendency to heavier loading of the smaller units in relation to capacity is again evident. If gross weights were proportional to semitrailer capacities, the 5-ton class would average 3.33 by 20,800 equals 69,200 pounds, whereas it actually averages 27,100 pounds.

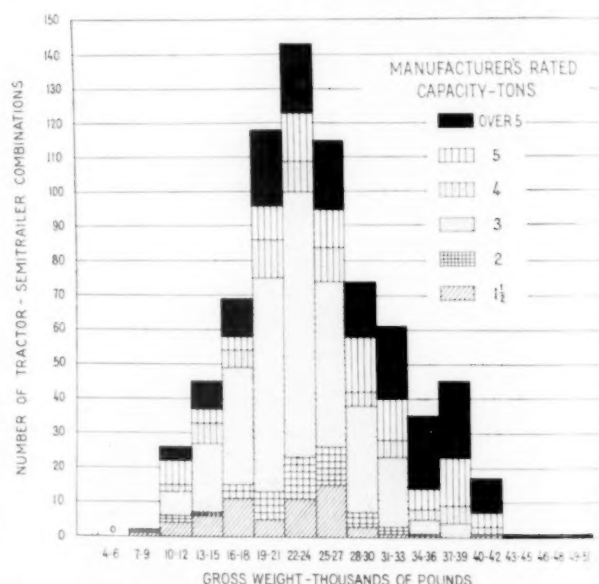


FIGURE 2.—FREQUENCY DISTRIBUTION BY GROSS WEIGHTS OF LOADED TRACTOR-SEMITRAILER COMBINATIONS.

Three cases of overloading, producing gross weights of over 42,000 pounds, are chargeable to the over-5-ton class. The group of gross weights between 40,000 and 42,000 pounds, which with the tolerance permitted by the State roads commission includes only legally loaded vehicles, shows a rated-capacity range of from 2 to over 5 tons.

In table 8 the heavier tractor-semitrailer combinations are shown in groups exceeding each of several gross-weight limits corresponding to those shown for single vehicles in tables 4, 5, and 6. These data show that the numbers of combinations exceeding the limits shown constitute a much larger percentage of the total number of such vehicles than in the case of either 4- or 6-wheel single vehicles. Nearly two-thirds of all semitrailer combinations observed exceed 21,000 pounds gross weight, and almost half weigh more than 24,000 pounds gross. While about one-fifth of the total number exceed 30,000 pounds, only 2.7 percent weigh more than 40,000 pounds. Here again it is apparent that the heavier gross loads are not by any means carried exclusively on vehicles of the larger rated-capacity classes. On the contrary the smaller rated-

TABLE 7.—Frequency distribution of gross weights of loaded tractor-semitrailer combinations, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average gross weight	Gross weight, 1,000 pounds															Total observations
		7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	46-48	49-51	
1½ tons.....	Pounds 20,800	Percent 1.8	Percent 7.0	Percent 10.5	Percent 19.3	Percent 8.7	Percent 19.3	Percent 26.3	Percent 5.3	Percent 1.8	Percent	Percent	Percent	Percent	Percent	Percent	Number 57
2 tons.....	23,200	2.1	4.3	2.1	8.5	17.0	25.6	23.4	8.5	4.3	2.1		2.1				47
3 tons.....	22,900		2.3	6.5	11.1	20.2	25.1	15.6	10.1	6.5	1.3	1.3					307
4 tons.....	24,700		3.2	9.7	8.1	17.7	14.5	16.2	6.4	8.1	4.8	8.1	3.2				62
5 tons.....	27,100		6.9	3.9	3.9	9.8	13.7	10.8	15.7	11.8	5.9	13.7	3.9				102
Over 5 tons.....	28,200		2.2	4.5	6.2	12.4	11.2	11.2	8.9	11.8	11.8	12.4	5.6	0.6	0.6	0.6	178

capacity classes are represented by significant numbers of vehicles in each group up to the 30,000-pound limit.

TABLE 8.—Classification of all heavy-loaded tractor-semitrailer vehicle combinations according to manufacturer's rated capacity and gross weight

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having gross weights exceeding—							
		21,000 pounds		24,000 pounds		30,000 pounds		40,000 pounds	
	No.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1½ tons	57	30	6.1	19	5.4	1	0.6		
2 tons	47	31	6.3	19	5.4	4	2.5	1	5.0
3 tons	307	184	37.3	107	30.6	28	17.4		
4 tons	62	38	7.7	29	8.3	15	9.3	2	10.0
5 tons	102	77	15.6	63	18.0	36	22.4	4	20.0
Over 5 tons.	178	133	27.0	113	32.3	77	47.8	13	65.0
Total	753	493	100.0	350	100.0	161	100.0	20	100.0
Percentage total loaded vehicles	100	65.5		46.5		21.4		2.7	

Table 9 shows the gross-weight-frequency distribution of all loaded vehicles. Four- and six-wheel single vehicles and semitrailer combinations of all rated capacities are here classified according to gross weight irrespective of type or rated capacity. The most significant indication of this tabulation is the large percentage of all loaded vehicles that exceed 21,000 pounds gross weight. It is shown that 16.5 percent of all loaded vehicles had gross weights in excess of the amount commonly assumed to correspond to a rated capacity of 5 tons.

LIGHT TRUCKS CARRY GREATEST OVERLOADS

It was possible by the methods employed to determine the weight of the load carried by 1,429 single vehicles and 219 semitrailer combinations. Table 10 shows the frequency distribution on the basis of the ratio of load carried to manufacturer's rated capacity for the single vehicles. As previously indicated in the

TABLE 10.—Frequency distribution of capacity use of loaded single vehicles, percentage of total observations in each capacity class

[illegible]

analysis of gross weight, it is here definitely shown that loading in excess of rated capacity is far more prevalent in the case of small trucks than of large ones. On the average, the 1½-ton trucks were found to carry one and two-thirds as much as the recommended load, while the 5-ton trucks averaged just about their rated-capacity load. In extremes, the smaller truck is loaded to 4, 5, and even 6 times its rated capacity; the larger one is seldom loaded more than twice its capacity.

TABLE 9.—Frequency distribution of gross weights of loaded vehicles of all classes, percentage of total observations

[Total number of vehicles observed, 5,592]

Gross weight	Percentage of total number of vehicles	Gross weight	Percentage of total number of vehicles
4,000-6,000 pounds	10.4	28,000-30,000 pounds	1.8
7,000-9,000 pounds	16.0	31,000-33,000 pounds	1.3
10,000-12,000 pounds	16.8	34,000-36,000 pounds	1.0
13,000-15,000 pounds	18.7	37,000-39,000 pounds	1.1
16,000-18,000 pounds	12.1	40,000-42,000 pounds5
19,000-21,000 pounds	9.5	43,000-51,000 pounds1
22,000-24,000 pounds	6.8		
25,000-27,000 pounds	3.9	Total	100.0

In figure 3 is shown a comparison of the numbers of loads of various weights carried by 1½- and 5-ton trucks respectively, on the basis of the total number of each class occurring in the gross weight analysis. It is significant that the 1½-ton truck appears in this graph as the carrier of loads between 6 and 10 tons more numerous than the 5-ton truck.

Table 11 shows an analysis of the loading of semitrailer combinations. Sufficient data could be obtained for only four capacity classes, but the evidence parallels that shown for single vehicles in table 10. Semitrailers of large rated capacity were found in practice to carry loads which, in the average, about equal the recom-

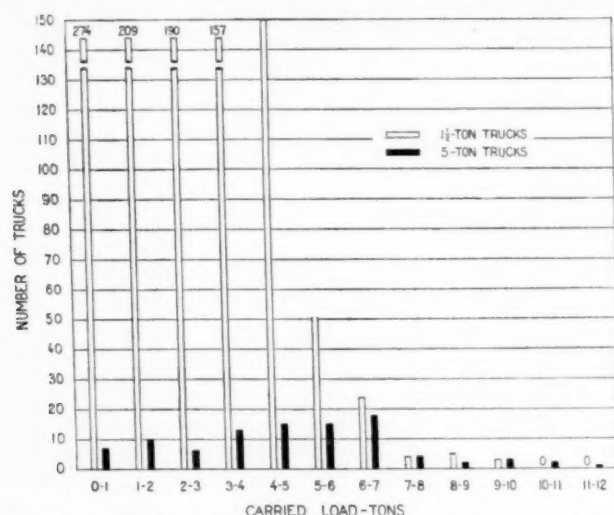


FIGURE 3.—TRUCKS OF 1½-TON AND 5-TON RATED CAPACITY CLASSED ACCORDING TO LOADS CARRIED.

mended load; the 1½-ton trailers were loaded even more heavily in excess of the rated capacity than the single vehicles of the same rating.

AXLE DISTRIBUTION OF GROSS WEIGHTS OF LOADED VEHICLES DISCUSSED

Tables 12, 13, and 14 show the frequency distribution of the percentage of gross weight of loaded vehicles carried by the rear axles of single trucks, tractors, and semitrailers. From them it may be concluded that, in the case of single vehicles, the weight carried on the rear axle averages approximately three-fourths of the gross load. Vehicles having gross loads less than 10,000 pounds carried an average of only 68 percent on the rear axle. The gross weight groups above 10,000 pounds all had an average of close to 75 percent for weight on the rear axle. Included among these vehicles were many partially loaded trucks, and the low average percentage of load on the rear axle is doubtless due to greater proportionate effect of the engine and the tendency to carry partial loading in the forward part of the truck body. There is a striking spread in the percentages for all gross-weight classes ranging from about 45 to 95 percent.

In the case of tractor-semitrailer combinations, it may be seen that about 45 percent of the entire gross weight of the combination is carried on the rear ends of both tractor and semitrailer, leaving about 10 percent for the front wheels of the tractor.

TABLE 11.—Frequency distribution of capacity use of loaded tractor-semitrailer combinations, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average ratio	Ratio of carried load to capacity																								Total observations		
		0-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.25	1.25-1.50	1.50-1.75	1.75-2.00	2.00-2.25	2.25-2.50	2.50-2.75	2.75-3.00	3.00-3.25	3.25-3.50	3.50-3.75	3.75-4.00	4.00-4.25	4.25-4.50	4.50-4.75	4.75-5.00	5.00-5.25	5.25-5.50	5.50-5.75	5.75-6.00		6.00-6.25	6.25-6.50
		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.		Pct.	Pct.
1½ tons	3.96		5.6			5.6	5.6		5.6		5.6	5.6																18
3 tons	1.94	3.1	5.5	4.7	2.4	9.5	11.8	4.7	7.1	11.0	8.7	11.8	7.1	0.8	6.3	3.1	0.8	1.6		5.6	5.6	10.9	5.6		16.3	5.6	5.6	17
5 tons	1.36	4.8	14.2	4.8		23.8	9.5	9.5	23.8																			21
Over 5 tons	.98	7.5	17.0	11.3	15.1	18.9	18.9	5.6	3.8				1.9															53

TABLE 12.—Frequency distribution of percentage of gross weight¹ of loaded single vehicles carried on rear axle, percentage of total observations in each gross-weight class

Gross weight	Average	Percentage carried on rear axle—												Total observations
		40	45	50	55	60	65	70	75	80	85	90	95	
		Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
Under 10,000 pounds	68.0	0.2	0.2	0.7	4.5	15.3	26.7	28.0	16.2	7.3	1.4	0.3	0.2	1,735
10, under 20,000	75.3	.1	.1	.5	.7	4.3	9.8	16.4	21.4	32.4	12.5	1.6		2,816
20, under 30,000	74.2		.2	.4	.4	2.7	8.1	25.1	35.6	18.8	7.0	1.5		609
30, under 40,000	76.7	1.3	1.3					11.5	35.9	38.4	10.3	1.3		78

¹ In the case of 3-axle, 6-wheel trucks the "gross weight carried on rear axle" is actually carried on 2 axles and 4 wheels.

TABLE 13.—Frequency distribution of percentage of gross weight of loaded tractor-semitrailer combinations carried on tractor rear axles, percentage of total observations in each gross-weight class

Gross weight	Average	Percentage carried on rear axle—											Total observations
		25	30	35	40	45	50	55	60	65	70	75	
		Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
10, under 20,000 pounds	45.2		1.0	5.0	25.8	40.0	18.9	6.2	1.7	0.7	0.7		401
20, under 30,000	44.3	0.1	.9	7.4	24.9	44.8	16.4	4.1	.9				772
30, under 40,000	44.5	.3	.5	3.8	25.1	48.9	17.1	3.8	.5				308
Over 40,000	43.6			9.3	25.6	51.2	11.	2.3					43

TABLE 14.—Frequency distribution of percentage of gross weight of loaded tractor-semitrailer combinations carried on semitrailer rear axle, ¹ percentage of total observations in each gross-weight class

Gross weight	Average	Percentage carried on rear axle—											Total observations
		20	25	30	35	40	45	50	55	60	65	70	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
10, under 20.....1,000 pounds..	39.7	0.7	2.9	14.2	21.0	23.7	23.9	10.2	2.5	0.7	0.2		419
20, under 30.....do.....	44.2	.3	1.0	4.2	9.6	20.2	33.6	24.0	5.1	1.4	.5	0.1	771
30, under 40.....do.....	42.5		.8	1.8	7.8	39.9	36.8	11.1	1.8				396
Over 40.....do.....	43.2				7.3	39.0	41.5	7.3	4.9				41

¹ In the case of semitrailers with 2 rear axles, 4 wheels, the "percentage of gross weight carried on rear axle" is actually carried on 2 axles and 4 wheels.

TABLE 15.—Frequency distribution of rear-wheel loads of loaded single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average wheel load	Rear wheel load, 1,000 pounds															Total observations
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1 ton.....	2,220	14.6	63.5	12.2	7.3		2.4										41
1½ tons.....	3,760	5.3	22.0	21.0	17.5	15.8	14.7	3.2	0.3	0.1	0.1						2,841
2 tons.....	5,230	.8	7.2	12.6	17.1	16.9	18.8	12.6	10.7	2.7	.6						515
2½ tons.....	5,760		3.9	10.6	15.9	16.5	17.4	15.0	9.1	8.5	2.0	0.9	0.2				460
3 tons.....	6,310	.2	1.5	7.9	11.2	13.9	15.4	20.4	16.4	8.7	3.7	.5			0.2		403
3½ tons.....	6,550	.8		7.7	10.0	12.4	17.8	16.3	16.3	11.6	4.7	1.6	.8				129
4 tons.....	6,050		2.7	10.8	5.4	16.2	29.8	13.5	8.1	10.8		2.7					37
5 tons.....	6,910		.8	4.1	7.8	9.0	16.1	20.6	19.4	17.3	3.7	1.2					243
Over 5 tons.....	6,050		5.6	8.3	11.1	8.3	27.8	5.5	27.8	2.8	2.8						36

TABLE 16.—Frequency distribution of the rear-wheel loads of loaded tractors, percentage of total observations in each capacity class

Manufacturer's rated capacity ¹	Average wheel load	Rear wheel load, 1,000 pounds											Total observations
		1	2	3	4	5	6	7	8	9	10	11	
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1½ tons.....	4,690	0.1	3.0	13.8	29.3	25.6	22.3	4.4	1.4	0.1			726
2 tons.....	5,510		2.1	5.6	17.8	25.8	23.3	16.0	8.0	1.0			287
2½ tons.....	6,400		1.0	2.4	12.9	19.1	17.2	16.7	16.3	12.9	1.0	0.5	209
3 tons.....	6,740			6.0	7.8	9.5	17.2	22.4	19.8	13.8	3.5		116
3½ tons.....	7,000				7.8	13.7	13.7	17.7	27.4	17.7	2.0		51
4 tons.....	7,000				11.1	16.7	5.6	22.2	27.7	5.6	11.1		18
5 tons.....	7,600				2.6	9.2	11.8	17.1	30.3	21.1	7.9		76
Over 5 tons.....	9,300						12.5		12.5	37.5		37.5	8

¹ Refers to capacity of the semitrailer.

TABLE 17.—Frequency distribution of rear-wheel loads of loaded semitrailers, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average wheel load	Rear wheel load, 1,000 pounds													Total observations
		1	2	3	4	5	6	7	8	9	10	11	12	13	
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1½ tons.....	4,680		14.6	10.9	18.2	23.6	20.0	7.3	3.6	1.8					55
2 tons.....	5,130	2.2	4.5	6.7	22.2	24.4	17.8	15.5	4.5	1.1	1.1				45
3 tons.....	5,010	.3	5.3	9.6	20.9	24.2	24.8	10.9	3.7	.3					302
4 tons.....	5,460		6.5	6.5	16.1	17.7	24.2	17.7	9.7	1.6					62
5 tons.....	5,570	.9	10.0	7.3	10.0	15.4	22.7	16.4	10.0	6.4	.9				110
Over 5 tons.....	5,960		4.2	11.3	14.3	13.7	13.1	17.2	14.9	8.3	1.8	0.6		0.6	168

Similar distribution data were also prepared for single vehicles and combinations without segregation into gross weight classes. These are not presented here as they have the same general characteristics as the data given in tables 12, 13, and 14. They show the following averages: For single trucks 72.8 percent; for tractors 44.6 percent; and for semitrailers 42.5 percent.

DATA ON WHEEL LOADS ANALYZED

Tables 15, 16, and 17, and figures 4, 5, and 6, show frequency distributions of rear-wheel loads of single vehicles, tractors, and semitrailers of various rated capacities. Average rear-wheel loads of single vehicles

are shown to range from a minimum of 2,220 pounds for trucks of 1-ton rated capacity to a maximum of 6,910 pounds for 5-ton trucks. Again it is found that the loads of the larger vehicles are not as great in relation to those of smaller vehicles as differences in rated capacity would suggest. The average of 6,910 pounds for 5-ton trucks, for example, is only 1.84 times the 3,760-pound average for 1½-ton trucks instead of 3.33 times as it would be if wheel loads were proportional to rated capacity. It is also apparent, particularly in relation to single vehicles (table 15), that the greatest wheel loads are not always found on vehicles of the largest capacity.

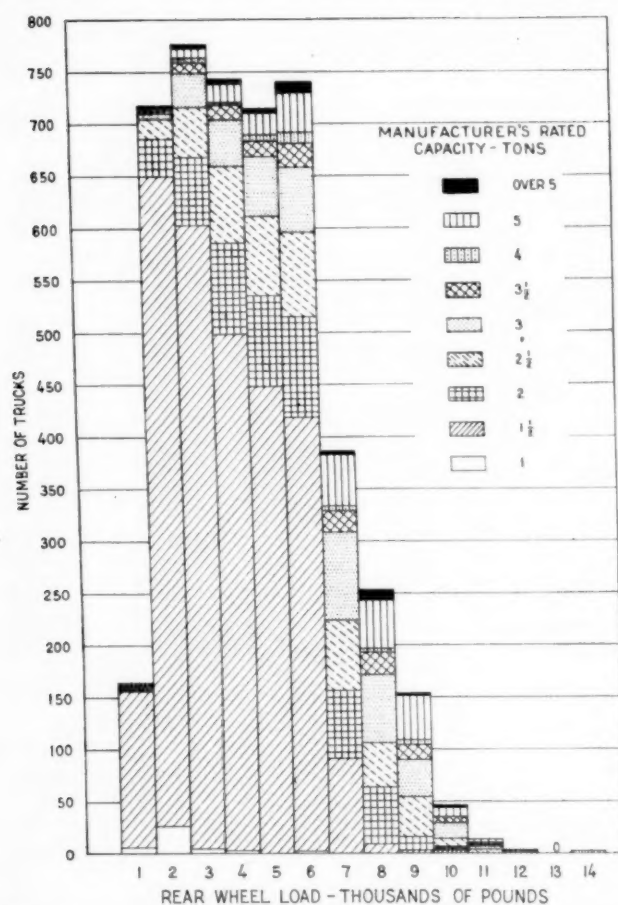


FIGURE 4.—FREQUENCY DISTRIBUTION OF REAR-WHEEL LOADS FOR LOADED SINGLE VEHICLES.

TABLE 18.—Classification of all loaded single vehicles with heavy wheel loads according to manufacturer's rated capacity and rear-wheel loads

Manufacturer's rated capacity	Total all loaded vehicles	Rear-wheel loads exceeding—							
		7,000 pounds		8,000 pounds		9,000 pounds		10,000 pounds	
	No.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1 ton.....	41								
1½ tons.....	2,841	13	2.8	4	1.9	2	3.3		
2 tons.....	515	72	15.5	17	8.0	3	5.0		
2½ tons.....	460	95	20.4	53	25.0	14	23.3	5	33.3
3 tons.....	403	119	25.6	53	25.0	18	30.0	3	20.0
3½ tons.....	129	45	9.7	24	11.3	9	15.0	3	20.0
4 tons.....	37	8	1.7	5	2.4	1	1.7	1	6.7
5 tons.....	243	101	21.7	54	25.5	12	20.0	3	20.0
Over 5 tons.....	36	12	2.6	2	.9	1	1.7		
Total.....	4,705	465	100.0	212	100.0	60	100.0	15	100.0
Percentage of total loaded vehicles.....	100.0	9.9		4.5		1.3		0.3	

In table 18 rear-wheel loads exceeding certain limits are classified according to the rated capacity of the vehicles on which they were observed. The limits chosen were 7,000, 8,000, 9,000, and 10,000 pounds. It is shown that of 4,705 loaded vehicles observed, only 465—less than 10 percent—had rear-wheel loads in excess of 7,000 pounds. Of these 465 vehicles only 113 or less than 25 percent were of 5 tons rated capacity or larger, and 180 or nearly 39 percent were of 2½ tons capacity or smaller.

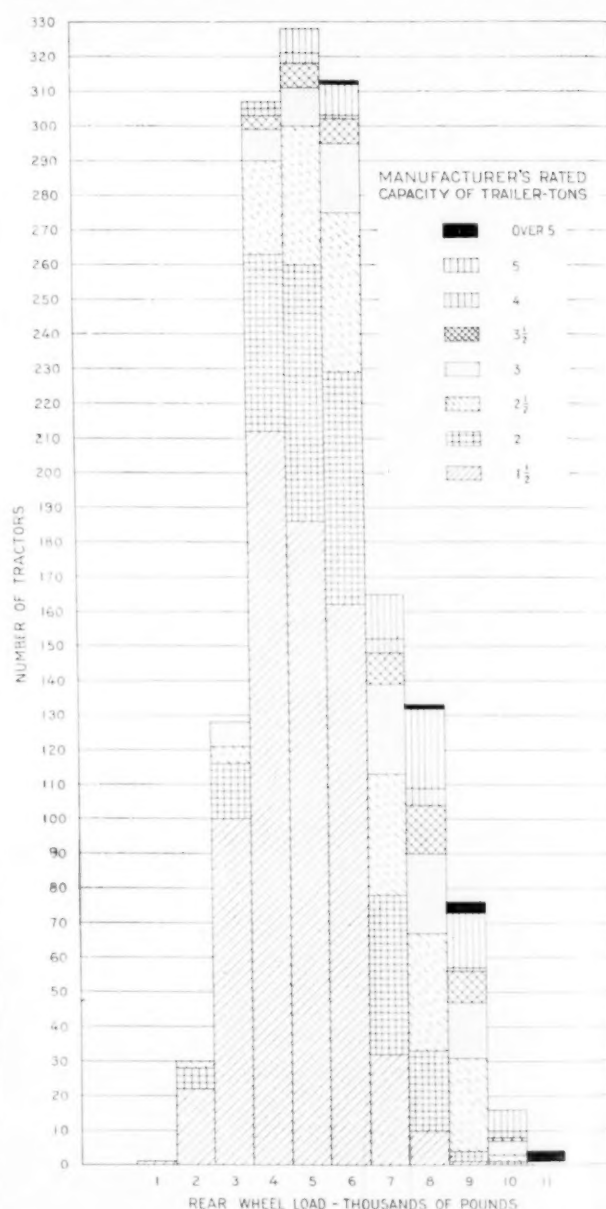


FIGURE 5.—FREQUENCY DISTRIBUTION OF REAR-WHEEL LOADS OF LOADED TRACTORS.

ity or larger, and 180 or nearly 39 percent were of 2½ tons capacity or smaller.

Vehicles with wheel loads exceeding 8,000 pounds numbered only 212 or 4.5 percent of the total of 4,705 vehicles observed and again the number of vehicles rated at 5 tons or more was less than the number of 2½-ton and smaller vehicles. Sixty or 1.3 percent of the total number of vehicles had wheel loads exceeding 9,000 pounds, and only 15 or about 0.3 percent had wheel loads greater than 10,000 pounds. In these two groups, as in the larger groups with wheel loads above 7,000 and 8,000 pounds, vehicles of the larger capacities were not the most numerous but were, on the contrary, exceeded in number by vehicles of 2½-ton capacity and smaller.

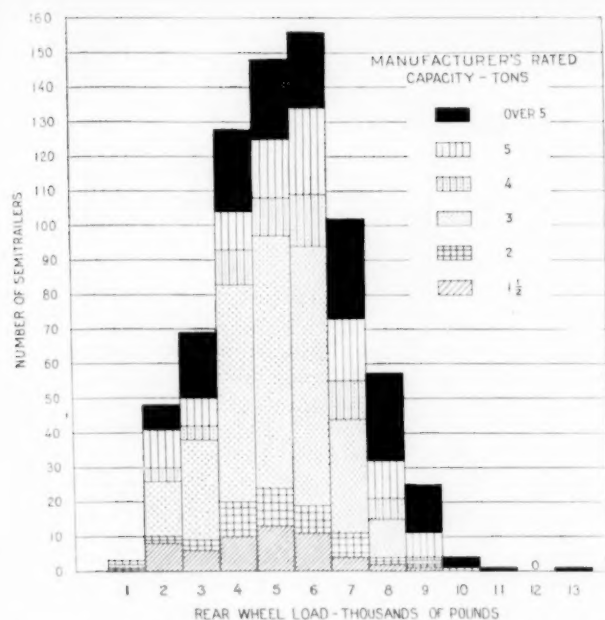


FIGURE 6.—FREQUENCY DISTRIBUTION OF REAR-WHEEL LOADS OF LOADED SEMITRAILERS.

TABLE 19.—Classification of all loaded tractors with heavy wheel loads according to manufacturer's rated capacity and rear-wheel loads

Manufacturer's rated capacity	Total all loaded vehicles	Rear-wheel loads exceeding—							
		7,000 pounds		8,000 pounds		9,000 pounds		10,000 pounds	
	No.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1½ tons.....	726	11	4.8	1	1.0	—	—	—	—
2 tons.....	287	27	11.8	4	4.2	1	5.0	—	—
2½ tons.....	209	64	27.9	30	31.3	3	15.0	1	25.0
3 tons.....	116	43	18.8	20	20.8	4	20.0	—	—
3½ tons.....	51	24	10.5	10	10.4	1	5.0	—	—
4 tons.....	18	8	3.5	3	3.1	2	10.0	—	—
5 tons.....	76	45	19.6	22	22.9	6	30.0	—	—
Over 5 tons.....	8	7	3.1	6	6.3	3	15.0	3	75.0
Total.....	1,491	229	100.0	96	100.0	20	100.0	4	100.0
Percentage of total loaded vehicles.....	100.0	15.4	—	6.4	—	1.3	—	0.3	—

In tables 19 and 20, the numbers of loaded tractors and semitrailers, respectively, with rear-wheel loads exceeding the several limits are shown to be approximately as numerous in relation to the totals of such vehicles as were the single vehicles similarly loaded. The tables show, however, that the heavier wheel loads on tractors and semitrailers are more frequently found on combinations of the larger capacities.

TIRE CAPACITY NOT EXCEEDED TO SAME EXTENT AS VEHICLE CAPACITY

In table 21 is shown the frequency distribution of the ratio of actual tire loads to the manufacturer's rated carrying capacity of the tires. Again the tendency for the smaller vehicles to carry loads out of proportion to their capacity is evident in the more frequent overloading of the smaller sizes of tires commonly found on such vehicles. It is to be remarked, however, that the tires are not as greatly overloaded as the vehicles, a fact that is doubtless due to the use of oversized tires on many of the smaller vehicles. Whereas, in extreme

TABLE 20.—Classification of all loaded semitrailers with heavy wheel loads according to manufacturer's rated capacity and rear-wheel load

Manufacturer's rated capacity	Total all loaded vehicles	Rear-wheel loads exceeding—							
		7,000 pounds		8,000 pounds		9,000 pounds		10,000 pounds	
	No.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1½ tons.....	55	3	3.4	1	3.2	—	—	—	—
2 tons.....	45	3	3.4	1	3.2	—	—	—	—
3 tons.....	302	12	13.6	1	3.2	—	—	—	—
4 tons.....	62	7	8.0	1	3.2	—	—	—	—
5 tons.....	110	19	21.6	8	25.8	1	16.7	—	—
Over 5 tons.....	168	44	50.0	19	61.4	5	83.3	2	100.0
Total.....	742	88	100.0	31	100.0	6	100.0	2	100.0
Percentage of total loaded vehicles.....	100.0	11.9	—	4.2	—	0.8	—	0.3	—

cases, 1½-ton trucks were found to carry loads up to six times their rated capacity and more, the extreme overloading of the smallest class of tires did not exceed 2.75 times the rated load of the tires. In the case of the largest tires—those rated at more than 4,000 pounds—the extreme overload observed was only 1.5 times rated capacity, and the number of loads in excess of rated capacity was only about 6 percent of the total.

The data presented in table 21 relate to both high-pressure and low-pressure tires indiscriminately. Similar distributions were made for the two classes separately, but as they were very similar to the distribution of the combined groups they are not included in this report.

VALUE OF C IN GROSS-WEIGHT FORMULA DISCUSSED

For the purpose of limiting the gross weight of vehicles and combinations of vehicles the American Association of State Highway Officials has recommended use of the formula, $W=C(L+40)$, in which W is the gross weight, C a coefficient, and L the length in feet between the centers of the extreme forward and rear axles of the vehicle or combination. The association recommended a value of 700 as the lowest value of C to be adopted as a limit in any State.

It has been definitely determined that limitation of gross weight is not needed as a measure of pavement or road surface protection. Tests have shown that the stress in rigid pavements caused by vehicular loads is a function of the wheel load rather than the gross load. If axles are spaced no closer than 3 feet between centers, it has been determined that the maximum stress caused by the combined wheel loads does not exceed that caused by each wheel load separately. As spacing closer than 3 feet is impracticable, the maximum wheel load of vehicles is the critical factor in design of pavements; and it is wheel load rather than gross load that must be limited for pavement protection.

On bridges the effects of loading are different. All wheel loads of a vehicle or combination of vehicles that can come upon the structure at one time are effective in producing stress, and the stress produced increases with the sum of the loads applied within a given length. For bridge protection, therefore, limitation of wheel load is not sufficient; limitation of gross load is also required. But the form of limitation to be adopted should give proper recognition to the length over which the load is applied. The formula recommended by the American Association of State Highway Officials is of that character; and the value of $C=700$, recommended as the

TABLE 21.—Frequency distribution of capacity use of tires on loaded vehicles, percentage of total observations in each capacity class
[High-pressure and low-pressure tires combined]

Manufacturer's rated capacity of tires	Average ratio	Ratio of total load on tire to tire capacity											Total observations
		0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1-2.....1,000 pounds..	1.09	0.4	10.3	20.4	23.4	22.8	15.2	4.4	2.2	0.7	0.1	0.1	2,023
2-3.....do.....	1.07	1.0	10.1	17.6	25.2	25.5	16.8	2.1	.5	.1	.1		4,169
3-4.....do.....	.93	1.6	13.1	23.9	38.2	20.0	2.7	.4	.1				1,867
Over 4.....do.....	.81	3.6	19.0	35.6	35.6	4.4	1.8						225

lowest limit to be adopted, has been found to give, for vehicles and combinations commonly employed, values of the gross load, W , that do not unduly overstress bridges designed for the association's standard $H-15$ loading.

Heretofore, determinations of the value of C corresponding to various types and combinations of vehicles have been based upon assumptions of probable or maximum permissible wheel loads. In this study values of C have been determined for vehicles of various types and sizes, as actually loaded, and frequency distributions of these values for single vehicles and for tractor-semitrailer combinations are given in table 22.

To understand the significance of the values of C in table 22, it is necessary to keep in mind that the gross-load limit derived from the formula is an upper limit normally associated with fully loaded or overloaded vehicles of the high-capacity classes. The large percentage of small values of C shown in the table is due to the inclusion of low-capacity vehicles and vehicles partly loaded, and these would rarely be affected by a gross-load limitation. Also, it is intended that the gross-load limit given by the formula be used in conjunction with an axle-load or wheel-load limit. In nearly all cases of 4-wheel trucks, the limit on axle or wheel load, not the gross-load formula, will control the gross load.

TABLE 22.—Frequency distribution of values of C in the gross-load formula, percentage of total observations

[Loaded vehicles only]									
Group	Total observations	Value of C							
		Under 100	100 to 200	200 to 300	300 to 400	400 to 500	500 to 600	600 to 700	Over 700
Single vehicles.....	Number 4,956	Pct. 5.9	Pct. 33.6	Pct. 36.1	Pct. 17.1	Pct. 5.5	Pct. 1.1	Pct. 0.5	Pct. 0.2
Tractor - semitrailer combinations.....	1,551	.1	5.2	23.1	35.4	23.6	11.4	1.1	.1

In view of these circumstances it is interesting to observe that only 0.2 percent of all observed single vehicles and 0.1 percent of all semitrailer combinations had gross weights corresponding to values of C above 700. For single vehicles the highest value was 770; but, discarding the 50 highest values (1 percent of the total observed number) the maximum is reduced to 550. For semitrailer combinations the highest observed value was 750, a maximum that would be lowered to 560 by elimination of the highest 1 percent of observed values.

Of the 4,956 single vehicles observed only 10 had gross weights and wheel-base lengths corresponding to values of C in excess of 700, the value recommended by the American Association of State Highway Officials as the lowest to be adopted as a limit in any State. Of these

10 trucks, 8 were definitely allocable to manufacturer's rated capacity classes, 2 to the 5-ton class, and 6 to the over-5-ton class. All of these vehicles were 6-wheel vehicles and were the property of a single owner. For trucks of large rated capacity, they had very short wheel bases, ranging from 14 to 15 feet. All were used in the local delivery of crushed stone from a nearby quarry. As they were all 6-wheel vehicles and their wheel loads did not in any case exceed 9,000 pounds they would not have been excluded by wheel-load limitations such as have been recommended by the American Association of State Highway Officials.

Twenty-five of the single vehicles had gross weights and lengths of wheel base resulting in values of C over 600 and not more than 700. Of these, 17 could be definitely allocated to rated-capacity classes, as follows: 2½-ton capacity, 2; 3-ton capacity, 1; 3½-ton capacity, 3; 4-ton capacity, 1; 5-ton capacity, 7; over 5-ton capacity, 3.

Of the 1,551 tractor-semitrailer combinations observed only one had gross weight and length resulting in a value of C over 700. This was the heaviest combination observed during the study. Its gross weight was 51,500 pounds and the distance, L , between its foremost and rearmost axles was 28.9 feet.

Values of C between 600 and 700 were found to correspond to 17 semitrailer combinations of which only 5 were classifiable by capacity, one in the 5-ton and the other 4 in the over-5-ton group.

WEIGHTS OF EMPTY VEHICLES AND RATED CAPACITY COMPARED

It is sometimes necessary to know average and extreme weights of empty vehicles of the several capacity classes. It is difficult to obtain this information from manufacturer's records because the weight of the assembled empty vehicle depends upon the type of body used. The manufacturer of the vehicle generally lists the chassis weights only. It has been a common assumption that there is an approximate equality between the weight of single empty vehicles and their rated carrying capacity. The average and distributed weights of empty vehicles of the several classes as observed in this investigation, given in table 23, will show how far from correct this assumption is. Similar data for semitrailer combinations are given in table 24.

CAPACITY OF TRUCK NO INDICATION OF OVER-ALL WIDTH

In the absence of precise information the assertion has been made that motor trucks of the larger capacity classes are commonly wider than those of smaller capacity and consequently require a greater width of pavement for their accommodation. Factors other than the width of the vehicles themselves bear upon the question of pavement width required, including the speed of the vehicles and the driving habits of their operators.

TABLE 23.—Frequency distribution of the weights of empty single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average empty weight	Weight empty, 1,000 pounds														Total observations
		2	4	6	8	10	12	14	16	18	20	22	24	26		
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number	
1½ tons	5,690	1.8	23.8	65.3	7.6	1.1	0.4								1,642	
2 tons	7,690		.6	34.1	48.7	14.0	2.3		0.3						3	
2½ tons	10,010			8.2	27.3	36.9	17.1	6.2	1.9	1.6	0.8				257	
3 tons	10,720			2.6	19.8	39.4	25.5	5.7	4.4	2.2	.4				228	
3½ tons	12,060			3.0	4.5	17.9	46.2	19.4	7.5	1.5					67	
5 tons	14,150			1.0	3.8	7.7	33.6	21.1	11.5	10.6	5.8	2.9	1.0	1.0	104	

TABLE 24.—Frequency distribution of the weights of empty tractor-semitrailer combinations, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average empty weight	Weight empty, 1,000 pounds												Total observations
		6	8	10	12	14	16	18	20	22	24	26		
	Pounds	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number	
3 tons	10,890	0.8	25.4	37.3	31.4	4.0	5.5	4.0					126	
5 tons	13,270		15.1	39.4	9.1	3.0	9.1	9.1	6.1	3.0		6.1	33	
Over 5 tons	14,320		2.6	15.8	19.7	17.1	22.4	14.5	7.9				76	

TABLE 25.—Frequency distribution of the over-all widths of loaded single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average width	Over-all width in feet																				Total observations	
		5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8		9.0
	Feet	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Number	
1½ tons	7.0	0.1	0.3	0.7	2.2	2.6	2.7	3.6	4.4	7.6	12.6	12.1	12.5	17.0	10.8	5.7	3.6	0.7	0.4	0.3	0.1	2,992	
2 tons	7.4				.8		.8	1.1	.9	3.0	6.9	11.4	15.4	12.0	20.6	14.4	8.3	2.4	.6	.6	.6	0.2	533
2½ tons	7.5				.2	.2	.4	.6	1.1	2.1	4.3	7.9	14.1	12.9	15.8	16.9	15.6	4.5	2.1	.9	.4		468
3 tons	7.7						.2	.2	.5	.7	2.9	4.3	11.2	24.5	21.4	23.0	7.7	1.5	1.2	.5	.2		413
3½ tons	7.7							.7		1.5	1.5	5.2	12.0	20.9	20.1	25.4	9.0	3.7					134
5 tons	7.9						.4			.4	.4	2.4	3.2	12.1	23.0	36.3	10.9	7.7	1.6	1.2	.4		248

TABLE 26.—Frequency distribution of the over-all widths of loaded tractor-semitrailer combinations, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average width	Over-all width in feet												Total observations
		6.4	6.6	6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4	8.6	
	Feet	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Number
1½ tons	7.5				1.8	3.6	12.8	23.7	30.8	20.0	7.3			75
2 tons	7.7						4.7	10.9	27.9	25.6	16.3	2.3	2.3	43
3 tons	7.7	0.3	0.6	1.6	2.9	4.2	16.1	31.4	19.7	14.2	6.8	1.9	0.3	310
4 tons	7.7				4.8	6.5	11.3	27.4	14.5	21.0	12.4	1.6		62
5 tons	7.8			1.0	1.0	1.0	7.8	18.4	26.2	34.9	7.8	1.1		163
Over 5 tons	7.9	.6		.6		2.2	5.1	11.8	21.3	45.4	10.7	1.1	.6	178

To the extent that width of the vehicle and its load influence the decision, some light is thrown upon the question by the classifications of over-all widths of observed single vehicles and combinations given in tables 25 and 26, respectively. Figures 7 and 8 are presented to sharpen the comparison between the 1½-ton and 5-ton classes. In the former it will be seen that the 1½-ton trucks were more numerous than the 5-ton vehicles in each width class up to and including the legal limit, 8 feet. Among the law-violating single vehicles the 5-ton trucks are slightly more numerous, and a single 5-ton truck 9 feet wide exceeds the 8.8-foot width of the widest 1½-ton truck.

Among semitrailers there is greater difference between the widths of vehicles of the two capacity classes, as shown in figure 7. No 1½-ton semitrailer combination was observed with over-all width in excess of 8 feet; and the widest 5-ton combination observed was only 8.4 feet wide.

Tables 27 and 28 show for single vehicles and semitrailer combinations, respectively, the number of units observed in excess of certain widths. Table 27 shows that 64.5 percent of all single vehicles observed had over-all widths in excess of 7 feet and nearly 50 percent of the wider vehicles were 1½-ton trucks. Only 4.6 percent of the total number of vehicles were over 8 feet in width and nearly a fourth of this group were of 5-ton capacity, but a greater number were of the 1½- and 2-ton capacities. Less than 1 percent of all the vehicles were more than 8½ feet in width and among them all capacity classes were represented with little difference in number, those of the 1½-ton class still exceeding the 5-ton trucks.

Table 28, similarly reviewing the width data for semitrailer combinations, shows that 96.3 percent of all combinations were more than 7 feet wide; 9.5 percent were more than 8 feet; and only 0.3 percent were wider than 8½ feet. Among these wide vehicles the 1½-ton

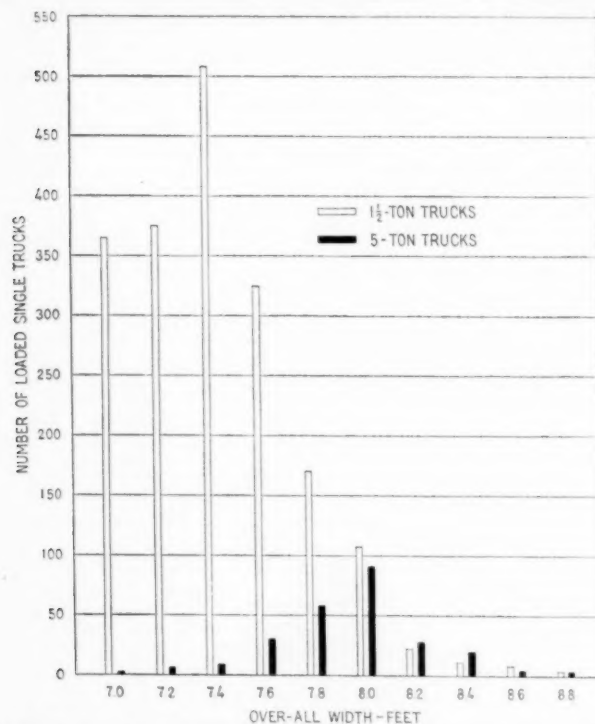


FIGURE 7.—COMPARISON OF NUMBERS OF LOADED 1½-TON AND 5-TON TRUCKS (RATED CAPACITY) OF VARIOUS OVER-ALL WIDTHS.

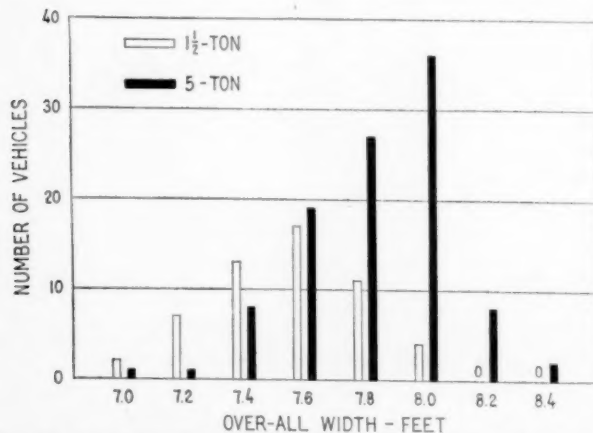


FIGURE 8.—COMPARISON OF NUMBERS OF LOADED 1½-TON AND 5-TON TRACTOR-SEMITRAILER COMBINATIONS (RATED CAPACITY OF SEMITRAILER) OF VARIOUS OVER-ALL WIDTHS.

size was not so strongly represented as among the single vehicles, but the several classes from 3-tons to over 5-tons capacity were represented with little distinction.

DATA ON HEIGHTS OF LOADED VEHICLES DISCUSSED

Tables 29, 30, 31, and 32 show the distribution of loaded vehicles according to over-all height in a manner corresponding to the previous analysis of width. The average height of the 1½-ton class is shown to be about one foot less than the average height of all trucks of other capacity classes. This is due to the presence in the smaller capacity group of large numbers of low trucks and not to the absence in that group of high vehicles. As shown by table 31, over 56 percent of all single trucks higher than 11 feet were of 1½-tons capac-

TABLE 27.—Classification of all wide single vehicles according to manufacturer's rated capacity and over-all width

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having over-all widths exceeding—					
		7 feet		8 feet		8½ feet	
	Number	Number	Percent	Number	Percent	Number	Percent
1½ tons.....	2,992	1,528	49.5	44	19.9	11	27.5
2 tons.....	533	400	13.0	23	10.4	7	17.5
2½ tons.....	468	389	12.6	37	16.8	6	15.0
3 tons.....	413	394	12.8	46	20.8	8	20.0
3½ tons.....	134	129	4.2	17	7.7	—	—
5 tons.....	248	245	7.9	54	24.4	8	20.0
Total.....	4,788	3,085	100.0	221	100.0	40	100.0
Percentage of total loaded vehicles.....	100.0	64.5	—	4.6	—	0.8	—

TABLE 28.—Classification of all wide tractor-semitrailer vehicle combinations according to manufacturer's rated capacity and over-all width

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having over-all widths exceeding—					
		7 feet		8 feet		8½ feet	
	Number	Number	Percent	Number	Percent	Number	Percent
1½ tons.....	55	52	7.2	—	—	—	—
2 tons.....	43	43	5.9	2	2.8	—	—
3 tons.....	310	293	40.5	28	39.4	1	50.0
4 tons.....	62	59	8.2	9	12.7	—	—
5 tons.....	103	101	14.0	10	14.1	—	—
Over 5 tons.....	178	175	24.2	22	31.0	1	50.0
Total.....	751	723	100.0	71	100.0	2	100.0
Percentage of total loaded vehicles.....	100.0	96.3	—	9.5	—	0.3	—

ity and so likewise were 63 percent of all trucks over 12 feet in height. The observations included only 3 trucks over 12½ feet high and 2 of these were of 1½-tons capacity.

Comparison of tables 31 and 32 shows that the number of semitrailer combinations of the greater heights was a larger proportion of the total than in the case of single vehicles; and again, as in the matter of width, the small-capacity semitrailer is less numerously represented than the small-capacity truck among the extremely high vehicles.

Figures 9 and 10 show graphically the composition by capacity classes of the numbers of trucks and semitrailer combinations of several of the greater-height groups.

OVER-ALL LENGTHS OF VEHICLES REPORTED

Tables 33, 34, 35, and 36 contain analyses of the over-all lengths of single vehicles and semitrailer combinations similar to those previously presented with regard to other characteristics of the vehicles.

The largest single vehicle observed, the capacity of which could be definitely determined, was 35 feet long. Four larger vehicles were measured, the largest 38 feet long, but these were of indeterminate rated capacity. Of the single vehicles of determinable capacity only 8 exceeded 33 feet in over-all length and 121, or 2.6 percent of the total number observed, exceeded 30 feet. In this connection it is desirable to emphasize that the length recorded was the over-all length of vehicle and load. It included the bumpers and projections of the load if any existed.

The longest semitrailer combination of determinable capacity was 52 feet long. Three that could not be classified by capacity were longer, the longest being 59 feet in length. Only 1 of the 728 semitrailer combi-

TABLE 29.—Frequency distribution of the over-all heights of loaded single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average height	Over-all height in feet—															Total observations
		6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	
1½ tons.....	Feet 8.4	Percent 2.2	Percent 9.8	Percent 13.0	Percent 10.6	Percent 10.8	Percent 12.4	Percent 14.7	Percent 11.0	Percent 6.6	Percent 3.6	Percent 2.2	Percent 1.5	Percent 1.0	Percent 0.5	Percent 0.1	Number 2,985
2 tons.....	9.0	.7	1.7	12.4	5.4	9.5	7.8	12.4	16.8	16.5	8.7	4.3	1.7	1.7	.4	-----	539
2½ tons.....	9.3	-----	.9	5.4	4.9	12.9	8.1	9.2	17.2	20.0	14.8	3.2	.9	2.1	.4	-----	466
3 tons.....	9.4	-----	1.0	4.1	9.7	8.7	6.8	10.2	13.4	17.4	18.8	4.8	2.9	1.0	1.0	.2	412
3½ tons.....	9.7	-----	-----	1.5	5.4	7.8	11.6	3.1	11.6	21.7	21.0	9.3	4.7	1.5	.8	-----	129
5 tons.....	9.4	.4	-----	.8	3.2	13.4	16.9	8.3	9.7	23.2	15.4	7.1	1.6	-----	-----	-----	254

TABLE 30.—Frequency distribution of the over-all heights of loaded tractor-semitrailer combinations, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average height	Over-all height in feet—															Total observations
		6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	
1½ tons.....	Feet 9.6	Percent 1.8	Percent 1.8	Percent 5.5	Percent 5.5	Percent 9.1	Percent 9.1	Percent 3.6	Percent 14.6	Percent 12.7	Percent 12.7	Percent 10.9	Percent 3.6	Percent 7.3	Percent 1.8	Percent -----	Number 55
2 tons.....	10.2	2.6	-----	2.6	-----	2.6	-----	-----	15.4	28.1	17.9	17.9	2.6	5.1	2.6	2.6	39
3 tons.....	10.2	.3	-----	3.0	3.4	4.4	2.0	5.8	9.9	17.3	18.7	13.9	12.2	5.8	3.0	.3	295
4 tons.....	10.7	-----	-----	-----	-----	-----	1.5	4.5	13.4	13.4	23.9	16.4	10.5	1.5	1.5	-----	67
5 tons.....	10.6	-----	-----	1.0	1.0	1.0	-----	3.9	1.0	22.6	29.4	25.6	12.7	2.9	-----	-----	102
Over 5 tons.....	10.6	-----	-----	.6	1.1	.6	3.4	1.7	2.8	12.4	30.8	31.4	11.8	2.8	.6	-----	178

TABLE 31.—Classification of all high, single vehicles according to manufacturer's rated capacity and over-all height

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having over-all heights exceeding—					
		11 feet		12 feet		12½ feet	
		Number	Percent	Number	Percent	Number	Percent
1½ tons.....	2,985	91	56.5	17	63.0	2	66.7
2 tons.....	539	20	12.4	2	7.4	-----	-----
2½ tons.....	466	16	9.9	2	7.4	-----	-----
3 tons.....	412	21	13.1	5	18.5	1	33.3
3½ tons.....	129	9	5.6	1	3.7	-----	-----
5 tons.....	254	4	2.5	-----	-----	-----	-----
Total.....	4,785	161	100.0	27	100.0	3	100.0
Percentage of total loaded vehicles.....	100.0	3.4	-----	0.6	-----	0.1	-----

TABLE 32.—Classification of all high loaded tractor-semitrailer vehicle combinations according to manufacturer's rated capacity and over-all height

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having over-all heights exceeding—					
		11 feet		12 feet		12½ feet	
		Number	Percent	Number	Percent	Number	Percent
1½ tons.....	55	7	5.1	1	6.2	-----	-----
2 tons.....	39	5	3.6	2	12.5	1	33.3
3 tons.....	295	63	45.6	10	62.5	1	33.3
4 tons.....	67	20	14.5	2	12.5	1	33.4
5 tons.....	102	16	11.6	-----	-----	-----	-----
Over 5 tons.....	178	27	19.6	1	6.3	-----	-----
Total.....	736	138	100.0	16	100.0	3	100.0
Percentage of total loaded vehicles.....	100.0	18.8	-----	2.2	-----	0.4	-----

TABLE 33.—Frequency distribution of the over-all lengths of loaded single vehicles, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average length	Over-all length in feet																	Total observations
		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1½ tons.....	Feet 20.8	Pct. 2.0	Pct. 2.7	Pct. 5.6	Pct. 7.9	Pct. 4.6	Pct. 11.0	Pct. 36.4	Pct. 13.6	Pct. 5.3	Pct. 3.5	Pct. 2.8	Pct. 1.9	Pct. 1.0	Pct. 0.4	Pct. 0.5	Pct. 0.3	Pct. 0.2	Number 2,953
2 tons.....	23.5	.2	.2	1.5	1.9	2.1	3.7	11.6	14.4	14.4	19.4	13.1	6.5	3.6	3.0	1.9	1.3	.7	536
2½ tons.....	24.0	.2	.4	.6	2.4	4.3	5.4	7.3	12.3	12.1	14.4	10.6	10.8	5.2	5.4	3.2	2.8	.9	463
3 tons.....	25.8	-----	.2	.2	1.2	1.7	2.0	2.5	4.9	6.6	11.8	14.2	15.2	12.6	9.6	4.7	3.2	4.2	407
3½ tons.....	26.3	-----	-----	.8	3.1	2.4	4.7	1.6	4.7	4.7	9.4	10.3	11.8	8.8	9.4	4.7	6.3	5.5	127
5 tons.....	25.6	-----	-----	1.2	.4	1.6	3.6	3.1	2.0	12.6	18.6	14.3	7.1	9.5	4.3	7.9	3.5	5.1	253

TABLE 34.—Frequency distribution of the over-all lengths of loaded tractor-semitrailer combinations, percentage of total observations in each capacity class

Manufacturer's rated capacity	Average length	Over-all length in feet														Total observations
		26	28	30	32	34	36	38	40	42	44	46	48	50	52	
1½ tons.....	Feet 33.2	Percent 1.6	Percent 8.1	Percent 16.1	Percent 30.6	Percent 17.8	Percent 8.1	Percent 12.9	Percent 1.6	Percent 1.6	Percent 1.6	Percent 1.6	Percent 1.6	Percent 1.6	Percent 1.6	Number 62
2 tons.....	33.5	2.3	13.6	20.5	20.4	11.4	6.8	9.1	4.5	6.8	4.5	-----	-----	-----	-----	44
3 tons.....	33.0	3.4	10.0	21.0	21.6	13.8	11.0	7.5	2.7	1.4	5.2	2.1	0.3	-----	-----	291
4 tons.....	36.7	-----	4.8	12.7	12.7	7.9	14.3	19.1	6.3	11.1	3.2	6.3	-----	1.6	-----	63
5 tons.....	33.7	7.2	16.5	8.2	9.3	15.5	23.7	10.3	3.1	2.1	2.1	1.0	-----	-----	1.0	97
Over 5 tons.....	34.3	.6	4.1	8.8	21.0	33.9	15.2	6.4	4.1	1.2	2.3	1.2	1.2	-----	-----	171

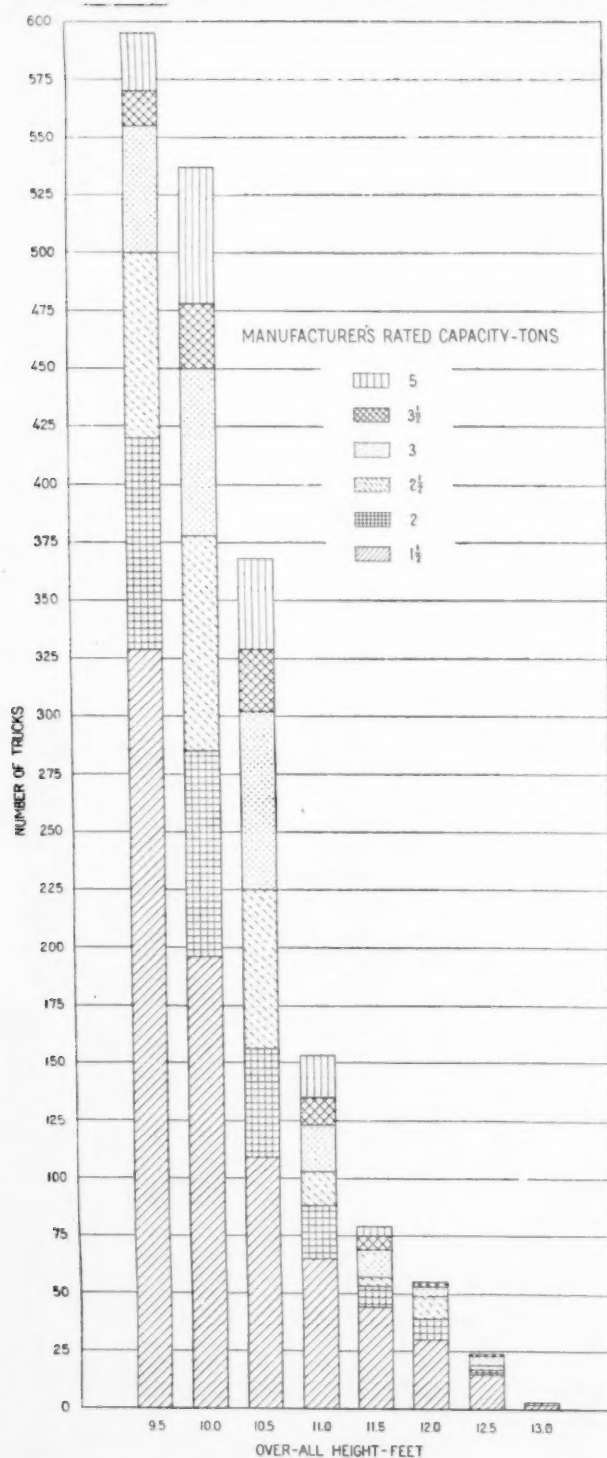


FIGURE 9.—LOADED TRUCKS IN HEIGHT CLASSIFICATION FROM 9½ TO 13 FEET GROUPED ACCORDING TO RATED CAPACITY.

nations that could be classified by capacity was more than 50 feet in length. Eighteen, or 2.5 percent of the total, were over 45 feet long; and 63, or 8.7 percent, were over 40 feet in length. More than one-third—253 of the 728 loaded semitrailer combinations classifiable by capacity—were more than 35 feet long over-all.

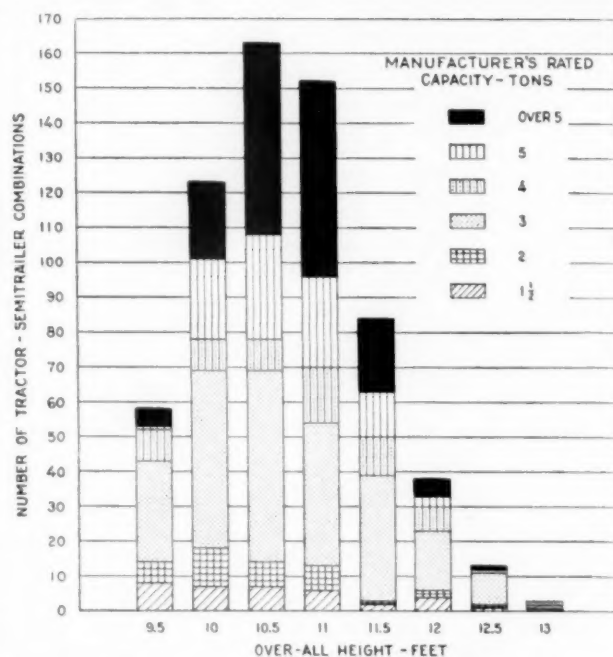


FIGURE 10.—LOADED TRACTOR-SEMITRAILER COMBINATIONS IN HEIGHT CLASSIFICATIONS FROM 9½ TO 13 FEET GROUPED ACCORDING TO RATED CAPACITY.

TABLE 35.—Classification of all long, loaded, single vehicles according to manufacturer's rated capacity and over-all length

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having over-all lengths exceeding—					
		25 feet		30 feet		33 feet	
	No.	No.	Pct.	No.	Pct.	No.	Pct.
1½ tons.....	2,953	135	17.4	15	12.4	—	—
2 tons.....	536	95	12.3	8	6.6	—	—
2½ tons.....	463	139	18.0	12	9.9	—	—
3 tons.....	407	222	28.7	38	31.4	1	12.5
3½ tons.....	127	74	9.6	22	18.2	3	27.5
5 tons.....	253	108	14.0	26	21.5	4	50.0
Total.....	4,739	773	100.0	121	100.0	8	100.0
Percentage of total loaded vehicles.....	100.0	16.3	—	2.6	—	0.2	—

TABLE 36.—Classification of all long, loaded, tractor-semitrailer vehicle combinations according to manufacturer's rated capacity and over-all length

Manufacturer's rated capacity	Total all loaded vehicles	Loaded vehicles having over-all lengths exceeding—									
		30 feet		35 feet		40 feet		45 feet		50 feet	
	No.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1½ tons.....	62	46	8.7	16	6.3	2	3.2	—	—	—	—
2 tons.....	44	28	5.3	14	5.5	5	7.9	—	—	—	—
3 tons.....	291	191	36.0	88	34.8	26	41.3	7	28.9	—	—
4 tons.....	63	52	9.8	39	15.4	14	22.2	5	27.8	—	—
5 tons.....	97	66	12.4	42	16.6	6	9.5	2	11.1	1	100.0
Over 5 tons.....	171	148	27.8	54	21.4	10	15.9	4	22.2	—	—
Total.....	728	531	100.0	253	100.0	63	100.0	18	100.0	1	100.0
Percentage of total loaded vehicles.....	100.0	72.9	—	34.8	—	8.7	—	2.5	—	—	—

As shown by tables 33 and 34, the longest vehicles and combinations were of large and intermediate capacity classes. The largest single vehicles of the 1½-, 2-, and 2½-ton classes were 32 feet long; the longest 1½- and 2-ton semitrailer combinations were 44 feet long.

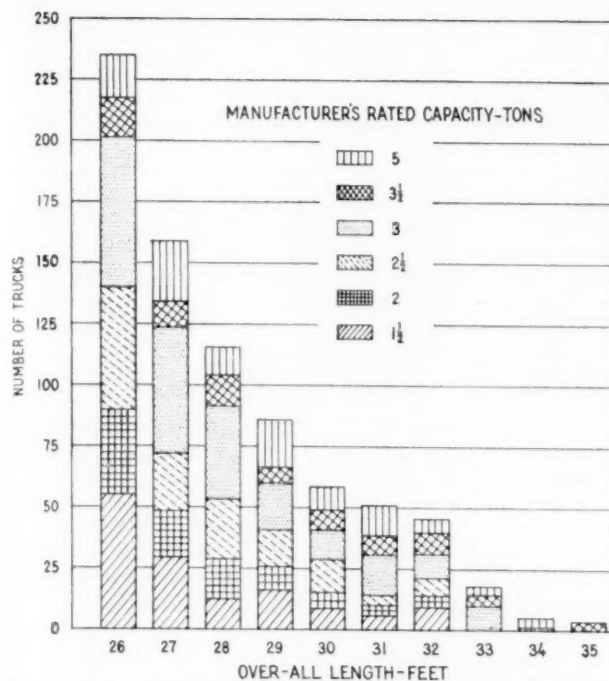


FIGURE 11.—LOADED SINGLE VEHICLES GROUPED ACCORDING TO OVER-ALL LENGTH AND WITHIN GROUPS ACCORDING TO RATED CAPACITY.

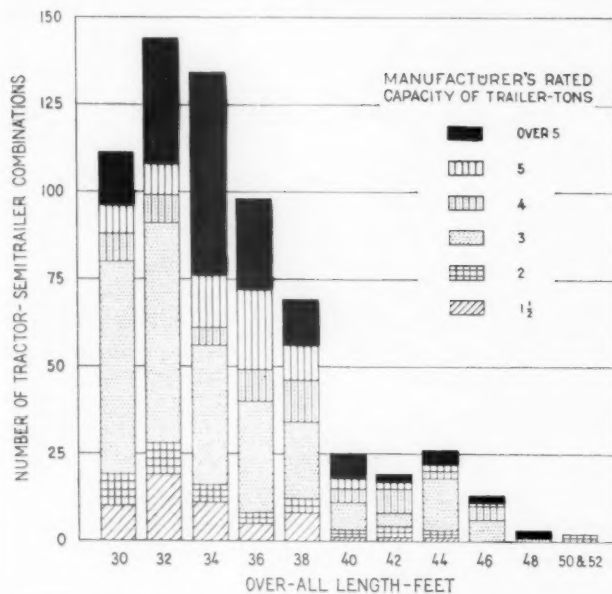


FIGURE 12.—LOADED TRACTOR-SEMITRAILER COMBINATIONS GROUPED ACCORDING TO OVER-ALL LENGTH AND WITHIN GROUPS ACCORDING TO RATED CAPACITY.

TABLE 37.—Weights and dimensions of combinations that included full trailers

Combination no.	Type of combination	Manufacturer's rated capacity	Gross weight of combination		Gross weight	Rear axle load		Percentage of gross weight carried on—					Tire arrangement ¹	Rear-wheel load		Ratio of tire load to tire capacity	Over-all height	Over-all width	Over-all length	Over-all wheel base	Ratio of over-all wheel base to over-all length	Value of "C" in formula W = C (L+40)	Character of load	Origin and destination
								Truck axle	Tractor rear axle	Semi-trailer axle	Full trailer													
			Front axle	Rear axle																				
		Tons	Lbs.	Lbs.	Lbs.	Pct.	Pct.	Pct.	Pct.	Pct.		Lbs.	Pct.	Feet	Feet	Feet	Feet							
1	Truck		77,080	38,520	32,140	42					6 D	8,035	101										{Maryland to Delaware.	
	Full trailer			38,560	25,760						6 D	6,440	80	9.5	7.8	58.7	49.7	1.18	860	Gasoline				
2	Tractor			15,700	9,240		29				4 D	4,620	59										Do.	
	Semitrailer		31,400	8,000					25		2 D	4,000	40	11.0	7.7	53.0	47.0	1.13	360					
	Full trailer	5		7,700	3,800					12	12	4 D	1,900	37										
3	Truck	3	39,800	24,425	18,770	47					4 D	9,385	130	9.4	7.1	42.7	38.1	1.12	500	Paper		{Maryland to District of Columbia.		
	Full trailer			15,375	7,330					39	18	4 D	3,665	83										
4	Truck	1½	11,700	9,200	7,150	41					4 S	3,575											{New York to Florida.	
	Full trailer			2,500	1,275					10	11	4 S	638		10.0	6.4	37.6	34.0	1.11	160	Furniture			
5	Truck	2½	36,800	18,500	14,740	40					4 D	7,370	145	11.8	7.7	42.4	37.4	1.13	490	Agricultural products		{North Carolina to New York.		
	Full trailer			18,300	9,000					25	24	4 S	4,500	125										
6	Truck	3½	39,375	25,200	16,450	42					4 D	8,225	105	11.8	7.7	48.8	44.3	1.21	470	Produce		{North Carolina to Maryland.		
	Full trailer			14,175	6,600					19	17	4 DD	3,300	100										
7	Truck	1½	25,540	15,180	12,370	48					4 D	6,185	149										{Florida to Pennsylvania.	
	Full trailer			10,360	5,300					20	21	4 S	2,150		8.0	7.0	37.8	33.0	1.15	350	Fruit			
8	Tractor	3½		12,700	8,100		26				4 D	4,050	51										{Delaware to Maryland.	
	Semitrailer	10	30,600		6,200					20		2 D	3,100	48	11.0	8.0	53.6	48.8	1.10	340	Freight			
	Full trailer	5		11,700	5,300						21	17	4 D	2,650	34									
9	Truck	2½	58,700	38,100	30,300	52					6 D	7,575	97	10.5	7.8	53.5	48.4	1.10	600	Soy beans		Do.		
	Full trailer	5		20,600	10,300						18	18	4 DD	5,150	79								{District of Columbia to Maryland.	
	Truck	3		24,000	18,300	47					4 D	9,150	127	9.5	7.2	42.6	38.0	1.12	500	Paper				
10	Full trailer		30,300	15,300	7,500						20	19	4 DD	3,750	85									

¹ The number designates the number of wheels on each unit. The letter indicates arrangement of tires on wheels carried by rear axle. D indicates dual tires and S indicates single tires. On full trailers DD means that wheels on both front and rear axles carry dual tires.

Figures 11 and 12 show graphically the relative numbers of single vehicles and semitrailer combinations of the several capacity classes in each of the larger length groups. It will be observed that single vehicles of low rated capacity were an important part of each length group up to 32 feet—the greatest length observed for such vehicles. In the case of semitrailer combinations, those of the lower rated capacities are an unimportant part of the total above the length of 38 feet.

**WEIGHTS AND DIMENSIONS OF FULL-TRAILER COMBINATIONS
GIVEN**

Only 10 combinations having full trailers were observed during the course of the survey. The weights,

dimensions, and other characteristics of these vehicles are given in table 37. In general their characteristics are similar to those of the tractor-semitrailer combinations which have been discussed in detail, but one should be noted particularly as the longest and heaviest combination observed during the period. This combination, with a gross load of 77,000 pounds and a length of 58.7 feet, had a value of C in the gross-load formula recommended by the American Association of State Highway Officials of 860. This is the largest value noted in the period of observation and exceeds the next largest value observed by nearly 100. This combination consisted of a tank truck and a tank trailer and was used to transport gasoline.

**REPORT ON TAXATION OF MOTOR VEHICLES IN
1932 AVAILABLE**

The full report on the study of motor vehicle taxation in 1932 by the United States Bureau of Public Roads is now available. The survey was begun in 1933 and completed in 1934 and is the broadest in scope yet attempted. The report includes not only State taxes but also Federal excise taxes, county and municipal taxes, personal-property taxes on motor vehicles imposed by State, county, and municipal jurisdictions,

and public bridge tolls. The data are analyzed so that the numbers and contributions of various classes of vehicles may be determined.

A digest of the report was published in *Public Roads*, October 1934. The full report, entitled "The Taxation of Motor Vehicles in 1932", consists of 270 pages and is for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C., for 35 cents. There is no supply for general free distribution. Orders should be sent direct to the Superintendent of Documents at the above address.

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION
AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

CLASS 1.—PROJECTS ON THE FEDERAL-AID HIGHWAY SYSTEM OUTSIDE OF MUNICIPALITIES

AS OF APRIL 30, 1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 18, 1934 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	\$ 3,947,753	2,129,921	\$ 6,077,674	\$ 3,132,239	\$ 2,945,435	312.1	\$ 2,566,948	\$ 729,230	\$ 1,231,916	151.8	\$ 74,001	\$ 126,641	12.2	\$ 4,283	\$ 659,414
Arizona	3,878,975	1,338,712	5,217,687	3,697,084	1,520,653	314.9	1,183,412	160,282	1,023,130	75.0	21,269	66,041	4.4	21,269	59,131
Arkansas	3,334,167	1,174,000	4,508,167	3,467,050	1,041,117	195.1	1,178,430	89,108	81,999	70.0	39,565	99,504	27.9	133,907	266,258
California	7,912,828	3,713,643	11,626,471	9,306,642	2,320,829	277.6	4,346,155	946,148	2,113,995	132.9		842,490	26.6	195	794,958
Colorado	3,437,265	2,424,504	5,861,769	4,082,455	1,779,314	132.4	1,973,918	122,944	1,733,560	94.8		4,973		10,825	21,774
Connecticut	1,404,213	607,500	2,011,713	1,759,279	252,434	14.5	1,451,228	608,934	979,728	23.4					
Delaware	877,566	461,697	1,339,263	868,470	470,793	12.0	296,479	8,774	277,801	6.8				3,377	
Florida	2,469,370	1,116,600	3,585,970	2,467,168	1,118,802	114.4	1,841,419	198,491	1,642,928	14.7				27,310	243,807
Georgia	5,065,752	2,558,795	7,624,547	5,493,273	2,131,274	294.4	2,750,461	1,381,647	1,368,814	25.4	64,972	287,681	3.6	109,700	905,290
Idaho	2,166,854	1,131,910	3,298,764	2,139,228	1,159,536	186.0	719,704	200,496	519,208	44.8	3,000	754,704	3.5	74	518,126
Illinois	4,442,467	3,060,041	7,502,508	1,994,129	19,269	34.2	3,978,753	2,494,062	1,484,691	66.1	77,951	1,650,630	113.1	36,658	1,14,359
Indiana	5,018,921	2,816,687	7,835,608	3,286,771	4,548,837	106.3	2,795,719	1,693,012	1,102,707	70.9					
Iowa	5,027,830	2,217,361	7,245,191	4,775,933	2,469,258	288.6	2,608,914	390,400	1,987,905	137.9				25,048	37,712
Kansas	3,744,422	1,571,114	5,315,536	4,995,181	330,355	587.3	2,142,297	56,400	2,086,601	164.4				32,701	376,228
Kentucky	1,527,354	1,601,224	3,128,578	3,334,568	33,971	284.1	879,436	340,336	419,173	72.2				239,694	
Louisiana	2,693,135	1,380,819	4,073,954	1,826,016	19,599	75.4	2,178,364	930,677	833,666	15.8	36,282	287,440	14.7	2,681	239,694
Maine	1,567,012	793,644	2,360,656	1,315,437	1,045,219	45.8	802,094	731,212	71,882	21.5	4,618	204,636	6.8	193,536	30,791
Maryland	1,782,283	289,609	2,071,892	1,931,495	16,517	16.5	1,001,394	731,212	268,182	21.5				2,681	68,331
Massachusetts	1,401,716	1,632,474	3,034,190	1,030,789	913,406	37.4	913,406	52,687	860,719	12.5				18,240	682,144
Michigan	3,226,280	4,922,469	8,148,749	4,757,686	228,94	228.4	3,546,825	1,850,600	1,696,225	134.3				33,247	594,535
Minnesota	4,561,011	5,633,297	10,194,308	4,253,085	1,840,277	891.3	684,609	179,096	615,513	103.7				128,470	
Mississippi	3,489,337	2,452,182	5,941,519	2,398,342	147,959	237.1	2,669,310	908,666	1,031,840	144.3	157,943	994,109	64.6	24,687	622,653
Missouri	2,437,552	2,152,468	4,590,020	4,425,755	163,265	482.6	1,524,328	309,027	1,733,216	86.8				74,430	175,754
Montana	4,465,849	2,174,268	6,640,117	4,425,755	960,638	482.6	1,524,328	309,027	1,733,216	86.8				29,479	152,198
Nebraska	3,914,441	1,982,182	5,896,623	3,871,728	147,959	237.1	2,669,310	908,666	1,031,840	144.3					
Nevada	2,909,387	1,350,356	4,259,743	2,659,138	131,492	272.1	2,297,360	309,027	1,733,216	86.8					
New Hampshire	692,119	449,751	1,141,870	636,604	505,172	147.9	1,524,328	309,027	1,733,216	86.8					
New Jersey	3,417,019	851,735	4,268,754	1,758,305	2,510,449	311.6	1,726,150	1,405,336	1,331,657	18.0				9,278	380,004
New Mexico	2,468,644	1,671,710	4,140,354	2,760,946	1,379,408	214.4	8,130,743	1,631,070	3,095,180	142.5				118,725	273,615
New York	10,465,672	3,746,600	14,212,272	10,617,113	3,595,159	168,910	5,944,341	1,405,336	1,331,657	18.0				118,725	273,615
North Carolina	4,761,147	2,040,068	6,801,215	3,501,810	3,299,405	504.8	1,472,608	946,161	362,335	160.3	199,106	298,813	21.9	282,059	1,076,287
North Dakota	2,902,224	1,469,444	4,371,668	2,605,891	1,765,777	1,023.9	3,055,418	31,600	2,923,818	22.3	101,236	142,612	2.2	167,066	614,243
Ohio	7,277,758	3,559,556	10,837,314	7,431,052	3,406,262	131.3	8,130,743	1,631,070	3,095,180	142.5				41,880	589,946
Oklahoma	4,604,107	4,604,107	9,208,214	3,501,810	5,706,404	504.8	1,472,608	946,161	362,335	160.3					
Oregon	3,053,044	2,342,990	5,396,034	3,053,044	2,342,990	304.3	2,311,466	913,197	1,398,269	90.0	10,029	317,624	13.1	1,310	372,967
Pennsylvania	6,691,194	4,554,082	11,245,276	5,495,190	5,750,086	184.4	5,469,477	1,405,336	1,331,657	18.0				50,696	201,032
Rhode Island	979,367	474,772	1,454,139	899,627	554,512	27.8	460,892	79,740	381,152	14.3	36,476	760,756	2.2	60,481	476,871
South Carolina	2,179,953	940,274	3,120,227	2,067,337	1,052,890	149.5	1,326,697	653,701	672,996	246.6				57,061	476,871
South Dakota	5,065,752	2,174,268	7,240,020	4,425,755	2,814,265	482.6	1,524,328	309,027	1,733,216	86.8					
Tennessee	4,246,309	2,106,453	6,352,762	3,920,708	2,432,054	182.5	1,626,631	249,628	1,377,003	53.3	9,468	213,044	7.5	36,444	487,666
Texas	1,588,643	6,858,253	8,446,896	11,164,929	144,622	1,011.7	4,058,166	36,994	4,021,172	382.2	46,720	1,314,516	108.2	5,353	1,044,614
Utah	2,367,205	1,066,345	3,433,550	2,277,280	1,156,270	304.1	810,936	41,652	514,884	61.7					
Vermont	824,184	465,442	1,289,626	967,616	322,010	47.9	347,973	10,670	337,303	15.4	52,625	113,407	4.2	14,677	14,493
Virginia	3,704,175	3,704,175	7,408,350	3,704,175	3,704,175	170.95	1,602,244	205,323	1,396,921	66.1				93,779	199,625
Washington	3,097,334	1,953,006	5,050,340	2,587,440	2,462,900	99.4	1,603,910	435,526	1,168,384	1.2	1,465	209,908	1.2	33,445	137,168
West Virginia	2,013,405	1,140,167	3,153,572	1,491,141	60,491	71.2	659,274	111,469	547,805	8.6	23,549	120,332	5.6	26,666	166,270
Wisconsin	4,697,514	4,287,975	8,985,489	4,115,451	4,870,038	207.5	1,631,168	249,628	1,381,540	28.2				99,041	62,238
Wyoming	2,290,663	1,666,368	3,957,031	2,034,070	337,256	499.5	1,107,179	205,102	902,077	104.7				3,391	47,605
District of Columbia															
Hawaii	1,693,344	594,778	2,288,122	273,974	2,014,148	13.6	1,765,040	1,412,579	352,461	26.0				6,791	594,778
TOTALS	185,269,048	94,465,778	279,734,826	156,007,939	7,161,339	12,164.5	94,812,145	26,005,283	57,438,630	4,371.1	1,109,441	14,553,129	1,153.3	2,066,345	15,462,648

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION
AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

CLASS 2—PROJECTS ON EXTENSIONS OF THE FEDERAL-AID HIGHWAY SYSTEM INTO AND THROUGH MUNICIPALITIES

AS OF APRIL 30, 1935

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION				BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 18, 1934 (1934 Funds)	Act of June 18, 1934 (1935 Funds)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	
Alabama	2,389,928	1,054,961	1,634,889	1,583,983	39,465	39.4	942,875	591,876	184,876	29.0	131,223	208,328	5.1	16,045	632,768	
Arizona	807,982	305,191	604,776	609,590	28,120	13.3	39,104	28,104	13,104	10.2	129,362	95,500	7.7	48,571	172,586	
Arkansas	1,884,534	851,085	1,571,476	1,494,286	17,953	41.1	689,485	395,600	204,475	10.2	101,076	271,228	6.0	13,171	365,134	
California	4,213,946	2,219,160	4,090,168	3,459,680	12,000	47.8	2,236,062	739,196	1,190,932	20.5	793,944	143,909	4.9	14,910	222,884	
Colorado	1,718,633	190,000	1,710,072	1,684,935	13,406	35.9	146,005	146,005	146,005	4.1	53,698	20,590	1.7	53,698	20,590	
Connecticut	809,407	426,500	798,075	798,075	6,949	10.3	140,239	140,239	140,239	1.2	143,909	143,909	1.7	143,909	143,909	
Delaware	160,109	370,849	531,762	460,282	14,973	7.2	6,870	6,870	6,870	1.1	2,898	38,272	1.8	126	114,072	
Florida	1,364,644	514,162	1,778,806	1,778,806	70,465	20.2	31,918	31,918	31,918	1.6	58,608	157,686	1.4	58,608	200,677	
Georgia	2,724,680	1,278,373	1,578,644	1,566,701	70,465	59.4	1,531,985	978,037	253,944	26.1	269,915	269,915	6.0	179,483	794,511	
Idaho	1,157,829	321,126	1,162,524	1,119,507	2,643	19.4	71,867	69,372	26,492	1.9	209,825	209,825	2.2	32,990	82,463	
Illinois	7,476,075	2,515,875	6,004,604	5,777,379	63,5	63.5	2,272,581	1,868,225	806,756	11.3	97,163	425,336	3.3	95,308	1,284,144	
Indiana	4,227,050	2,136,308	2,959,435	2,601,685	60.3	60.3	1,601,321	1,882,696	355,381	18.1	138,381	1,031,047	20.6	25,088	709,298	
Iowa	2,614,472	1,311,000	1,974,158	1,891,668	7,085	54.0	1,283,041	721,555	446,115	17.4	1,000	217,795	6.8	39	600,065	
Kansas	2,522,401	1,432,949	2,203,006	2,203,006	34,017	39.4	1,740,329	1,740,329	1,740,329	16.4	30,000	101,467	4.8	40,092	436,794	
Kentucky	1,927,428	954,578	1,402,627	1,366,429	1,402,627	31.3	841,127	595,517	309,695	8.5	212,124	212,124	1.3	5,822	436,794	
Louisiana	1,708,277	744,560	739,639	703,619	34,046	19.0	1,212,112	922,541	263,091	16.4	82,217	149,761	4.3	297,660	297,660	
Maine	960,466	490,045	855,547	855,547	39,466	16.4	39,466	47,071	54,375	5.4	150,628	98,817	2.6	293	138,853	
Maryland	891,152	492,515	596,127	596,127	34,046	4.1	311,690	34,046	34,046	1.4	150,628	98,817	2.6	293	138,853	
Massachusetts	5,007,199	847,600	2,125,586	2,004,041	104,400	13.4	3,126,137	2,476,372	228,789	5.7	14,950	51,025	9.9	46,787	571,587	
Michigan	3,900,638	1,613,142	3,245,466	3,056,216	104,400	38.8	1,635,650	1,412,750	323,440	14.6	516,099	37,879	5.8	30,433	667,251	
Minnesota	3,719,143	1,401,194	3,832,379	3,000,538	195,923	108.1	303,794	172,113	323,440	12.2	516,099	37,879	5.8	30,433	667,251	
Mississippi	1,704,659	399,022	713,564	672,600	27,695	26.1	1,039,485	854,340	135,888	27.2	182,165	75,122	8.7	31,414	115,318	
Montana	4,019,501	1,617,461	2,404,560	2,404,560	71,115	33.2	1,826,442	1,826,442	1,826,442	11.2	22,415	63,817	2.9	120,511	1,440,291	
Nebraska	1,957,240	991,091	2,439,993	1,943,947	166,420	37.0	607,903	607,903	607,903	10.4	79,919	79,919	2.1	13,693	136,409	
Nevada	500,091	100,000	479,600	479,600	49,851	9.4	57,842	57,842	57,842	1.4	26,150	26,150	1.3	26,150	42,158	
New Hampshire	740,335	282,366	721,984	668,776	49,851	15.9	131,823	71,559	60,095	3.0	60,095	60,095	1.3	60,095	132,460	
New Jersey	3,117,921	1,809,820	2,580,387	2,450,108	173,331	21.4	1,190,787	691,254	434,690	5.7	3,119	208,357	8.8	26,593	1,166,483	
New Mexico	1,674,154	529,526	1,564,750	1,395,399	173,331	35.3	271,016	194,818	76,138	6.5	14,950	51,025	9.9	46,787	571,587	
New York	8,295,661	3,796,621	7,002,321	6,277,447	293,400	59.9	5,007,781	1,859,357	2,959,290	29.1	3,119	208,357	8.8	26,593	1,166,483	
North Carolina	2,120,216	1,210,216	2,800,342	2,091,279	101,308	78.1	590,746	142,205	396,091	15.4	91,217	432,801	12.3	55,872	278,037	
North Dakota	1,210,216	1,210,216	1,210,216	1,210,216	1,210,216	42.9	285,153	285,153	285,153	10.7	210,216	210,216	21.4	210,216	210,216	
Ohio	4,335,686	2,393,593	4,031,940	4,031,940	14,575	51.8	1,872,680	286,500	1,535,130	26.7	40,500	281,150	3.1	44,650	58,648	
Oklahoma	2,304,200	1,171,255	1,383,657	1,270,146	50,805	42.3	810,340	398,184	409,099	10.7	35,871	339,237	5.2	1,492	371,793	
Oregon	1,256,724	867,977	1,544,079	1,454,079	30,404	29.4	514,079	66,635	935,512	8.6	518	238,716	6.2	1,492	171,428	
Pennsylvania	2,397,703	3,941,570	3,941,570	3,941,570	110,906	55.4	2,530,867	1,480,091	935,512	24.3	33,869	719,302	5.7	64,253	631,983	
Rhode Island	579,625	285,760	519,489	519,489	114,760	1.4	141,760	141,760	141,760	1.5	64,694	71,638	3.6	64,694	144,000	
South Carolina	1,304,791	642,000	1,061,019	1,061,019	1,061,019	33.8	197,079	281,028	166,007	12.7	115,854	125,648	7.9	221,760	221,760	
South Dakota	1,502,670	704,311	1,040,346	1,040,346	858	35.8	190,946	125,946	67,022	7.6	115,854	125,648	7.9	221,760	221,760	
Tennessee	2,123,195	1,121,790	1,691,413	1,642,201	37,444	24.0	759,732	759,732	759,732	7.3	18,745	184,393	1.9	10,960	610,214	
Texas	6,842,863	1,795,000	5,010,219	4,822,542	37,599	184.0	2,032,785	1,408,559	363,895	31.5	18,745	184,393	1.9	10,960	610,214	
Utah	778,426	535,173	778,426	695,146	65,900	20.2	332,964	125,130	187,708	4.5	18,745	184,393	1.9	10,960	610,214	
Vermont	500,509	240,611	434,659	399,070	35,998	11.9	217,197	97,244	105,265	4.0	67,775	107,356	2.7	4,191	28,000	
Virginia	2,008,468	941,447	1,775,571	1,631,253	139,165	36.5	1,081,522	711,646	437,787	8.2	3,957	326,462	6.8	3,121	27,879	
Washington	1,977,850	776,603	2,073,550	1,931,253	139,165	36.5	1,081,522	711,646	437,787	8.2	3,957	326,462	6.8	3,121	27,879	
West Virginia	1,342,270	570,085	1,017,695	968,033	13,293	16.7	359,679	344,463	14,816	4.7	89,374	72,008	2.7	75,875	469,568	
Wisconsin	1,596,113	1,306,513	2,891,867	2,807,423	15,575	52.3	491,512	491,512	491,512	8.7	67,775	107,356	2.7	4,191	28,000	
Wyoming	1,155,334	25,416	581,667	581,667	2,784	22.5	2,784	141,009	141,009	3.0	89,374	72,008	2.7	75,875	469,568	
District of Columbia	946,445	241,460	922,671	696,281	226,390	6.5	250,164	250,164	250,164	.2					12,500	
TOTALS	115,822,240	46,769,343	93,691,444	86,076,420	2,204,340	1,742.6	43,846,914	22,992,477	18,219,654	510.2	2,395,469	10,037,133	217.4	2,377,889	18,184,086	

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION
 AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

CLASS 3.—PROJECTS ON SECONDARY OR FEEDER ROADS

AS OF APRIL 30, 1935

STATE	APPORTIONMENTS			COMPLETED			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS		
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	\$ 2,032,492	\$ 1,004,560	\$ 1,074,572	\$ 1,073,694	\$ 101,099	81.6	\$ 1,467,169	\$ 908,470	\$ 578,699	99.1	\$ 238,167	\$ 238,167	20.9	\$ 49,929	\$ 248,495
Arizona	285,463	598,032	642,741	516,393		52.6	687,377	9,090	58,790	57.2	58,169	58,169	8.7		234,974
Arkansas	1,495,634	857,084	1,253,086	1,231,347		149.0	458,317	156,640	301,661	59.5	296,237	296,237		76,047	259,226
California	3,440,340	1,999,203	3,590,636	2,948,114		164.3	1,493,714	494,605	868,356	45.0	432,620	432,620	24.1	1,700	638,227
Colorado	1,718,632	871,502	1,940,267	1,605,435	91,447	196.0	1,029,409	110,000	610,398	127.5	75,032	75,032	5.0		88,776
Connecticut	699,180	420,868	160,282	160,282		3.1	31	498,838	235,769	16.4				185,099	
Delaware	441,113	270,449	314,981	214,590	90,382	29.4	362,440	262,563	99,863	30.3	39,000	39,000	11.7	1,763	1,763
Florida	1,320,515	1,521,453	1,521,453	1,521,453	217,422	106.4	936,933	770,461	126,532	54.9	336,449	336,449	32.2	19,150	92,374
Georgia	2,320,973	1,278,313	1,367,483	1,364,873							306,570	306,570		185,638	845,571
Idaho	1,121,562	824,450	1,328,724	1,101,360	56,671	156.1	149,003	3,441,885	143,712	54.1	95,000	95,000	13.6	20,202	189,067
Illinois	5,652,228	3,345,525	2,231,124	2,194,495		134.1	6,020,232	310,433	2,576,347	314.6	769,178	769,178	36.7	7,931	7,931
Indiana	731,872	135,970	393,706	348,288		44.2	325,333	14,900	113,139	12.3	113,139	113,139	12.3	33,152	7,931
Iowa	2,413,358	1,590,000	2,148,119	1,930,791	164,500	320.6	1,704,567	1,401,175	1,011,175	290.5	314,400	314,400	82.0	707	9,625
Kansas	2,522,401	1,330,995	2,116,510	2,113,655	74,572	219.0	1,287,748	381,293	326,495	69.0	27,493	27,493	6.5		
Kentucky	1,537,926	1,336,409	1,858,708	1,715,113	41,263	214.0	1,447,628	107,202	1,024,165	135.4	270,981	270,981	40.6	15,611	
Louisiana	1,486,879	838,953	967,569	963,328	146,816	47.9	542,816	308,877	233,939	20.6	575,867	575,867	30.1	27,287	29,447
Maine	842,479	427,897	1,074,290	842,479		56.7	296,302	172,534	19,278	20.9	213,449	213,449	5.7	5,535	5,535
Maryland	831,132	1,067,934	735,179	692,648		58.1	354,022		391,735	26.8					464,750
Massachusetts	448,195	870,000	1,177,470	1,177,470		15.2									
Michigan	3,184,067	1,613,142	2,899,613	2,822,095	16,400	205.5	1,409,527	341,727	919,993	59.4	115,370	115,370	5.5	18,443	794,630
Minnesota	2,376,415	1,361,815	2,384,797	2,189,842	143,394	286.7	1,207,137	155,444	919,993	117.4	228,132	228,132	14.7	20,205	41,167
Mississippi	1,744,669	394,023	961,631	961,631		101.6	717,351	717,351	235,551	58.4	101,700	101,700	24.0	43,374	292,283
Missouri	2,923,273	2,423,463	2,957,393	2,687,722	193,360	634.0	1,376,118	235,551	1,095,313	217.8	22,312	22,312	165.8		362,621
Montana	1,859,937	942,434	1,874,716	1,794,032	116,145	237.7	644,011			62.2	91,140	91,140	8.6	105,905	91,138
Nebraska	1,957,240	991,091	2,110,304	1,952,560	147,769	402.5	776,186			82.8	36,984	36,984	3.6	4,580	80,151
Nevada	1,136,479	892,000	1,290,773	1,113,354	151,347	148.6	469,768	29,000	469,768	61.3				23,126	230,865
New Hampshire	477,395	242,365	526,497	526,497	77,387	24.8	114,607			5.9	82,386	82,386		49,425	
New Jersey	55,299	160,000	56,528	55,299		-5					111,963	111,963	1.7		348,037
New Mexico	1,272,129	735,120	1,327,617	1,235,198	87,479	231.8	4,374,470	515,500	3,959,790	247.4	49,388	49,388	7.4	97,721	97,721
New York	3,608,768	3,422,700	3,401,689	3,038,336	28,089	84.3					954,500	954,500	44.8	54,942	210,362
North Carolina	2,380,573	1,950,637	2,288,022	2,130,201	153,794	290.1	1,441,278	223,812	1,217,466	195.4	60,000	60,000	12.8	26,560	159,377
North Dakota	1,451,112	734,741	899,590	894,911		75.5	409,971	321,903	88,068	119.9	12,129	12,129	119.9	60,319	445,985
Ohio	3,671,148	1,966,253	3,977,509	3,704,933	14,300	299.4	1,294,130	73,810	1,176,520	29.5	169,999	169,999	14.1	92,404	445,033
Oklahoma	2,304,199	1,171,295	2,002,195	1,689,014		298.2	1,271,601	441,491	696,789	59.9	321,215	321,215	21.7	3,694	194,291
Oregon	1,536,784	777,096	1,698,447	1,507,131	29,332	113.2	822,180	19,526	704,095	55.8			5.6	67	5,686
Pennsylvania	7,344,822	2,639,003	6,441,096	6,216,317	81,028	945.5	3,523,019	1,128,595	2,306,191	213.5	114,181	114,181	5.6	137,603	
Rhode Island	439,716	294,040	449,748	439,716		33.2	212,963	239,531	212,963	6.7				41,478	
South Carolina	1,562,970	1,422,000	1,074,380	1,074,380	148,151	115.5	1,094,312	239,531	815,765	132.2	49,827	49,827	49.9	1,015	44,201
South Dakota	1,562,970	761,311	1,222,360	1,174,167		346.5	371,342	310,094	61,248	110.5	16,937	16,937	88.4	1,053	404,681
Tennessee	2,123,195	1,075,748	1,429,481	1,359,013		112.6	1,096,305	672,589	423,716	96.5			21.9	77,091	296,512
Texas	6,012,517	3,638,000	6,563,615	5,992,080	167,506	773.5	1,901,492	43,300	1,858,197	188.3	1,842,217	1,842,217	80.7	17,132	296,512
Utah	1,048,676	533,173	1,223,505	994,655		182.1	468,945	94,022	289,373	13.0	80,675	80,675	2.7		24,324
Vermont	418,880	244,364	469,597	437,125	16,569		199,930	101,973	191,496	15.0			2.5	1,795	37
Virginia	1,699,920	94,447	1,699,920	1,699,920	8,755	211.1	682,968	36,153	508,727	92.9	147,140	147,140	21.4	16,045	216,777
Washington	1,080,673	775,693	1,075,593	1,044,580	7,099	63.7	735,194	36,153	688,372	52.7					81,137
West Virginia	1,118,559	570,083	745,430	701,270		41.2	547,924	386,659	161,065	20.6			6.4	5,193	277,490
Wisconsin	2,431,320	1,841,394	2,327,342	2,149,288	46,953	141.2	1,128,704	270,460	671,969	12.9	25,237	25,237	12.1	11,472	479,942
Wyoming	1,145,332	571,928	1,145,332	1,047,499	78,683	157.2	99,718	27,126	72,591	12.9	50,747	50,747	105.6		43,377
District of Columbia	972,038	730,382	1,102,038	972,038	130,094	8.7	324,587			3.8					210,360
Hawaii	177,718	351,000	177,718	177,718		4.9									351,000
TOTALS	92,908,707	56,835,891	82,993,578	76,468,128	2,866,032	4,846.4	49,015,576	14,809,311	31,828,843	3,921.6	944,683	944,683	1,272.1	1,096,545	10,041,394

PUBLICATIONS of the BUREAU OF PUBLIC ROADS

Any of the following publications may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. As his office is not connected with the Department and as the Department does not sell publications, please send no remittance to the United States Department of Agriculture.

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Report of the Chief of the Bureau of Public Roads, 1927. 5 cents.
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Report of the Chief of the Bureau of Public Roads, 1929. 10 cents.
Report of the Chief of the Bureau of Public Roads, 1931. 10 cents.
Report of the Chief of the Bureau of Public Roads, 1932. 10 cents.
Report of the Chief of the Bureau of Public Roads, 1933.
Report of the Chief of the Bureau of Public Roads, 1934.

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No. 347D . . Methods for the Determination of the Physical Properties of Road-Building Rock. 10 cents.
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- No. 62MC . . Standards Governing Plans, Specifications, Contract Forms, and Estimates for Federal-Aid Highway Projects. 5 cents.

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Federal Legislation and Regulations Relating to Highway Construction. 10 cents.
Supplement No. 1 to Federal Legislation and Regulations Relating to Highway Construction.
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The Taxation of Motor Vehicles in 1932. 35 cents.

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- Reports on Subgrade Soil Studies. 40 cents.
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SEPARATE REPRINT FROM THE YEARBOOK

- No. 1036Y . . Road Work on Farm Outlets Needs Skill and Right Equipment.

TRANSPORTATION SURVEY REPORTS

- Report of a Survey of Transportation on the State Highway System of Ohio (1927).
Report of a Survey of Transportation on the State Highways of Vermont (1927).
Report of a Survey of Transportation on the State Highways of New Hampshire (1927).
Report of a Plan of Highway Improvement in the Regional Area of Cleveland, Ohio (1928).
Report of a Survey of Transportation on the State Highways of Pennsylvania (1928).
Report of a Survey of Traffic on the Federal-Aid Highway Systems of Eleven Western States (1930).
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A complete list of the publications of the Bureau of Public Roads, classified according to subject and including the more important articles in PUBLIC ROADS, may be obtained upon request addressed to the U. S. Bureau of Public Roads, Willard Building, Washington, D. C.

CURRENT STATUS OF UNITED STATES PUBLIC WORKS ROAD CONSTRUCTION

AS PROVIDED BY SECTION 204 OF THE NATIONAL INDUSTRIAL RECOVERY ACT (1934 FUNDS) AND BY THE ACT OF JUNE 18, 1934 (1935 FUNDS)

SUMMARY OF CLASSES 1, 2, AND 3.

AS OF APRIL 30, 1935

STATE	APPORTIONMENTS			COMPLETED			UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS		
	Sec. 204 of the Act of June 18, 1934 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	
Alabama	8,370,133	4,259,842	6,478,199	5,789,877	75,355	433.0	4,895,992	2,295,375	2,000,675	279.3	209,284	643,135	38.3	75,097	1,540,677	
Arizona	5,211,960	2,641,935	5,860,400	4,823,006	374,153	360.7	1,909,893	1,89,752	1,595,960	133.4	159,322	218,711	9.9	69,840	466,491	
Arkansas	6,746,335	3,428,049	5,935,624	5,138,222	168,696	395.9	2,769,773	1,895,748	1,527,150	195.7	140,639	1,063,405	68.3	223,765	888,898	
California	15,607,394	7,972,206	16,947,646	13,410,599	14,200	449.7	8,075,911	2,179,950	4,171,283	198.5	3,137	2,128,694	55.5	16,405	1,616,069	
Colorado	8,874,310	3,446,026	7,803,194	6,584,691	785,948	448.2	3,159,352	232,944	2,499,863	226.3		80,004	5.0	53,698	120,141	
Connecticut	2,865,740	1,454,868	1,767,448	1,753,616	6,949	27.8	2,331,871	1,107,713	955,734	41.0		143,909	1.7	4,331	348,276	
Delaware	1,419,048	923,395	1,881,701	1,947,303	312,926	78.7	665,330	271,596	341,145	37.1	2,498	83,092	13.5	448	146,232	
Florida	5,231,634	2,461,343	6,346,338	4,346,384	319,521	221.4	1,372,866	174,131	1,277,818	57.1	64,971	67,146	61.7	105,060	176,813	
Georgia	10,091,145	5,113,491	6,659,063	4,485,444	403.5	403.5	4,485,444	3,150,145	1,753,393	284.7		804,115		471,221	2,593,378	
Illaho	4,446,399	2,277,446	4,630,487	4,186,445	166,607	361.5	1,280,375	249,168	1,016,498	101.8		304,925		53,936	789,856	
Illinois	17,570,770	8,241,401	10,229,969	9,437,003	13,269	235.8	12,371,666	7,464,401	4,906,765	391.9	70,011	1,553,218	43.5	134,975	2,442,149	
Indiana	10,051,660	5,118,361	8,901,249	8,650,089	335,005	561.2	5,605,222	1,931,825	3,575,495	446.7	1,000	669,459	101.7	716	691,548	
Iowa	10,095,660	5,118,361	8,901,249	8,650,089	226,005	661.2	5,605,222	1,931,825	3,575,495	446.7	1,000	669,459	101.7	716	691,548	
Kansas	10,083,604	5,117,675	9,815,688	9,248,210	375,125	664.7	2,160,372	1,712,713	1,447,659	271.7	27,493	500,341	13.1	65,140	1,040,154	
Kentucky	7,511,399	3,816,311	6,862,960	6,416,050	74,834	449.5	2,868,292	1,017,175	1,749,637	216.2	30,000	1,140,857	76.0	54,134	812,982	
Louisiana	5,424,591	2,963,932	3,558,878	3,491,163	53,647	142.3	3,931,493	2,062,294	1,330,716	52.9	245,447	1,013,068	49.2	27,287	566,501	
Maine	3,369,517	1,711,586	3,555,453	2,491,470	146,816	146.8	1,176,562	290,947	886,895	34.8	88,566	322,731	10.1	2,934	375,144	
Maryland	3,364,527	1,810,058	1,931,571	1,868,277	16,517	71.5	2,477,939	1,067,192	996,497	50.6	171,247	211,449	6.2	457,112	945,595	
Massachusetts	6,597,100	3,350,478	4,026,820	3,494,571	120,600	66.1	2,939,059	2,939,059	1,034,087	18.2	14,950	348,027	13.2	83,470	1,964,361	
Michigan	12,736,227	6,452,568	11,267,537	10,649,987	469.7	469.7	6,332,002	2,050,077	4,519,325	208.4	516,059	1,321,425	76.9	70,213	491,018	
Minnesota	10,656,569	5,465,551	1,759,473	1,443,465	1,636.1	1,636.1	2,335,500	506,613	1,828,886	233.3		786,830	90.6	190,432	1,202,881	
Mississippi	6,378,675	3,590,237	6,294,895	4,032,671	315,294	369.8	4,858,546	2,348,467	1,159,327	270.0	362,070	1,174,971	97.5	99,475	920,234	
Missouri	12,180,706	6,173,740	10,508,944	9,531,116	193,340	874.1	5,601,236	2,340,020	2,965,205	314.6	23,343	1,071,202	17.2	196,427	1,944,153	
Montana	7,439,744	3,769,734	8,531,712	7,207,910	1,076,943	753.6	2,309,888	34,846	2,177,532	202.3	28,667	230,935	30.0	164,355	244,285	
Nebraska	7,424,961	3,964,364	9,337,068	7,767,835	368,219	806.3	3,375,309	25,924	3,147,590	193.1	3,918	188,574	13.6	31,285	200,022	
Nevada	4,546,917	2,302,396	4,859,513	4,296,393	283,199	430.1	1,744,279	179,532	1,503,437	212.8	17,734	19,895	2.6	92,258	495,866	
New Hampshire	1,959,439	993,462	1,487,165	1,484,166	127,253	51.6	770,771	160,288	965,518	21.4		101,061	3.8	45,465	175,644	
New Jersey	6,346,039	3,200,879	4,514,852	4,263,607	641,986	53.5	2,916,837	2,046,600	966,347	23.7	3,119	760,038	5.5	35,831	1,894,494	
New Mexico	5,732,975	2,941,700	6,177,461	5,919,496	496,419	594.6	1,414,182	317,448	1,425,840	143.4		222,261	22.5	80,822	651,313	
New York	22,330,101	11,377,921	21,021,323	18,031,652	1,076,943	594.6	17,512,994	3,375,927	9,104,220	419.1		993,400	50.6	382,522	733,483	
North Carolina	9,522,293	4,840,941	9,172,462	7,723,291	561,034	913.1	3,304,633	1,214,178	1,977,492	331.2	250,323	788,314	46.9	334,501	1,513,701	
North Dakota	2,258,512	1,175,512	3,434,024	3,434,024	23,875	548.4	6,468,150	378,957	5,638,840	186.6	445,382	893,432	370.8	251,534	1,462,684	
Ohio	15,444,592	7,805,012	15,935,582	14,763,269	23,875	548.4	6,468,150	378,957	5,638,840	186.6	445,382	893,432	370.8	251,534	1,462,684	
Oklahoma	9,216,798	4,685,180	8,269,896	7,844,331	117,410	594.7	4,393,467	1,222,874	2,690,373	160.6	45,900	978,576	39.9	3,694	898,621	
Oregon	6,106,896	3,097,814	6,671,594	5,936,751	204,379	328.5	2,959,399	36,951	2,266,529	121.3	70,318	286,778	11.1	2,869	340,128	
Pennsylvania	18,691,004	9,590,788	15,893,066	14,988,262	362,237	723.4	11,543,363	3,752,217	7,364,368	333.0	36,015	889,965	12.7	114,509	970,618	
Rhode Island	1,924,704	1,014,572	1,937,643	1,858,334	27,818	61.1	914,018	79,740	814,095	22.2	151,368	551,319	55.7	60,694	195,678	
South Carolina	2,770,345	1,462,416	4,462,416	4,321,069	95,502	640.7	2,260,257	1,027,739	1,794,788	364.8	220,198	1,114,286	220.2	280,474	1,063,297	
South Dakota	6,011,479	3,047,845	4,980,312	4,423,069	95,502	640.7	2,260,257	1,027,739	1,794,788	364.8	220,198	1,114,286	220.2	280,474	1,063,297	
Tennessee	8,402,619	4,302,991	7,776,205	6,961,922	101,596	319.1	3,462,668	1,392,210	1,994,066	117.1	13,992	792,956	31.4	124,495	1,414,382	
Texas	24,244,024	12,591,653	23,440,052	21,979,351	37,789	1,899.1	8,792,443	1,864,493	6,559,321	562.0	105,466	3,007,092	197.6	294,309	2,355,051	
Utah	4,154,708	2,152,691	4,809,543	3,681,020	504,813	440.7	1,612,463	307,705	991,962	141.3		317,775	19.6	5,903	258,740	
Vermont	1,467,573	946,007	1,906,133	1,779,032	45,033	97.0	765,099	107,918	506,062	33.3		294,483	9.4	20,623	42,530	
Virginia	7,416,747	3,762,630	6,762,630	6,178,683	345,062	337.1	3,386,793	874,943	2,166,257	127.2	137,216	609,414	47.2	221,915	717,260	
Washington	6,115,467	3,106,412	5,995,885	5,496,214	345,062	199.6	2,834,379	528,607	2,133,495	96.1		381,682	3.4	36,604	246,184	
West Virginia	4,474,234	2,280,335	3,693,430	3,520,764	74,185	129.8	1,566,437	843,391	704,594	46.9	78,199	345,668	14.7	31,859	1,113,728	
Wisconsin	9,724,861	4,841,837	9,107,185	8,671,962	72,394	149.7	2,044,574	875,351	2,044,574	126.5	182	177,396	49.7	177,396	647,019	
Wyoming	4,541,347	2,287,712	4,672,212	4,672,212	414,703	679.1	1,542,660	377,337	1,542,660	180.6	50,747	730,793	174.5	5,023	103,680	
Unincorporated	1,418,469	973,462	2,004,749	1,668,249	356,444	15.2	574,751	250,164	324,587	3.9		66,390	.4	6,791	227,440	
Hawaii	1,418,469	973,462	2,004,749	1,668,249	356,444	15.2	574,751	250,164	324,587	3.9		66,390	.4	6,791	227,440	
TOTALS	394,000,000	200,000,000	599,999,995	530,522,487	12,311,911	22,393.5	187,674,697	63,807,071	107,487,097	8,803.9	4,129,543	36,492,864	2,642.8	5,540,859	43,704,108	